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U. S. NAVY

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TRUMAN H. NEWBERRY,
Acting Secretary.

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PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service not only will they be employed to some purpose as merited, but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

C. F. STOKES,
Surgeon General, U. S. N.

U. S. NAVAL MEDICAL BULLETIN.

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SPECIAL ARTICLES.

THE APPLICATION OF PSYCHIATRY TO CERTAIN MILITARY PROBLEMS.[1]

By W. A. White, M. D.

Gentlemen: I am here to-day very largely, I believe, as the result of several talks which I have had with your Surgeon General respecting the problem that has been recently so keenly in his mind, namely, the problem of what he terms temperamental fitness of men in the naval service for the different duties that have to be performed. I have been asked to give in this lecture such suggestions as I am able to cull from the various sources at my disposal which may throw light upon this problem and which may be of assistance in enabling the department to better adjust the individual to the specific things that will be demanded of him, more especially in time of war.

This problem is not only a difficult one, but it makes the very greatest demands that can be made upon science, namely, it calls upon science to predict, an ability which we believe ideally belongs to it, but which we are accustomed to see applied most accurately in that department of mathematics which deals with the motions of the heavenly bodies and less accurately or not at all in the biological sciences. To be able to foretell how a given human being will act under conditions which can not be reproduced for experimental purposes is a problem which might at first blush, at least, seem practically unsolvable.

In order that one may approach this problem at all intelligently, I may be pardoned if I lead up to it with certain preliminaries, which, while they may not bear directly upon the problem itself, at least will serve the purposes of orientation. Some years ago, shortly after taking charge of the Government Hospital for the Insane, I visited quite a large number of institutions for the care and treatment of the insane in foreign countries, and one of the enduring impressions that I brought back with me was that in very many of

[1] Lecture delivered at the summer conference, 1913, U. S. Naval War College.

the institutions where I went I found either a military man on duty at the institution, perhaps working in the laboratory, or courses of lectures being given at the institution for the special instruction of military surgeons. It did not take very profound thinking to see the applicability of this sort of work and to appreciate that psychiatry had certain special applications to the military service. Consequently, upon my return to this country, fully impressed with the importance of military psychiatry, I took up the question with the medical departments of both the Army and Navy, with the final result that both branches of the military service detailed a medical officer to the hospital for the purpose of studying the bearings of psychiatry upon military problems.

The general purpose which I had in mind when I pleaded for this recognition of the importance of psychiatry to the military service was to prevent as far as possible the enlistment of defectives. I felt that the military service naturally attracted certain types of mental defectives, which would not be difficult to exclude by a reasonable examination before concluding the enlistment, for then, as now, I appreciated that the object of an army and a navy is efficient service in time of war, and that the defective, who might, perhaps, get along after a fashion in time of peace, under the stress of actual war conditions would be pretty sure to go to pieces, and then, especially on a battleship, would not only be useless, but a source of positive danger, perhaps requiring to some extent the services of other men who might better be engaged in doing something else.

From this rather simplistic conception of the necessity for a military psychiatry the whole matter, as the result of the studies which we have been carrying on at the hospital for some few years past, has considerably broadened, and we have accumulated quite a mass of valuable data regarding the so-called insane in our military organization and also in the military organizations of foreign countries. In consequence we have found that the rather simple question of the enlistment of defectives merely has opened the door to a series of problems of all sorts of degrees of importance of which the one that I am especially to speak of to-day is perhaps the most important, surely the most difficult.

One of the first things that was found, for example, was that defectives could not always be easily determined at the examination that was made at the time of enlistment, and that therefore the three months probationary period which now precedes the completing of the enlistment in the Army was really necessary in some instances to determine the fitness of the applicant. With the accumulation of all enlisted men at a few large depots, their systematic training over a period of three months, and their observation and examination during this period, it ought to be practically possible to eliminate all who

are grossly defective. The reason why such a probationary service is desirable, and why an examination without such a service is sometimes ineffectual, bears directly upon the particular problem that we have to consider. Unless the examination is conducted by a highly skilled individual, it may be quite impossible to detect defects that come out when the enlisted man is placed under service conditions. The problem that one has really to deal with here is the problem of the ability of the man to meet certain complex conditions effectively. It is the problem of an efficient machine, and the best way to solve the problem of the efficiency of a machine is to see how it does the work for which it is intended, and so actual service conditions under competent observation are far better for determining the value of an enlisted man than laboratory experiments or psychological examinations, unless, of course, the defect is very gross, in which case these examinations will serve not only to disclose it, but to measure it.

The corollary to this, of course, is that service conditions should be sufficiently strenuous to eliminate a large proportion of the unfit, while on the other hand the enlisted man is entitled to sufficient observation during this period of service and elimination, so that it may not be necessary for him to develop a mental disease in order to have his condition appreciated. This latter matter comes up very emphatically with relation to a considerable proportion of the court-martial cases. It is our experience at the hospital—of course, naturally, with only a small number of the total cases, and with a selected number at that—that the enlisted man who is repeatedly guilty of minor offenses against the military regulations should in every case be subject to mental examination; that, as a matter of fact, he is entitled to that consideration; for it has been shown over and over again that men with a history of repeated offenses who are subsequently sentenced to prison are men who are not adapted by reason of mental deficiency to the service, who are incapable of adjusting to its demands, and whose offenses are merely an expression of this deficiency. It is therefore manifestly unfair that such a man should be crowded with punishments, finally imprisoned under sentence, and subsequently found to be mentally unsound and sent to an institution for the insane, if the whole situation could, as I believe it could in many instances, have been foreseen, and not only the expense, worry, and trouble of all these procedures averted, but greater justice done the man himself.

It is a popular delusion that the ne'er-do-well, the black sheep of the family, will be picked up and made a man of by the discipline of military life. Quite the contrary is usually the case. The ne'er-do-well is a ne'er-do-well because he lacks the ability of continuous effort along any specific line of endeavor; he lacks the power of continuous application; he lacks the habit of industry; and when he is subjected

to the rigid discipline of the military organization he of necessity endeavors to slip from under the weight of his responsibilities and duties, and so begins that series of minor infractions of military regulation which frequently ends so disastrously.

Looking at the series of facts which I have thus only briefly suggested, one can not but be impressed, from a new point of view, that the game of war is primarily a game for brains, and that no matter how important muscle and brawn may be, they are only after all means to the utilization of brains and not an end in themselves. While this has always been so, it is more manifestly so to-day than at any previous time in the history of the world. Battles used to be fought hand to hand, but now they are most elaborately and carefully planned in all their details and preceded by weeks, and perhaps months, of maneuvering, and, of course, years of preparation. Manifestly those who break down under peace conditions represent only the very poorest material that is enlisted, and it is to be expected that a considerable additional number will break down under conditions of war.

The greatest number of mental breakdowns come in the first enlistment, which of course means that as the enlisted man becomes better accustomed to service conditions and has shown in the first instance his ability to fit into the situation, he is more apt to be the man who will go along in the organization without further trouble.

As at present constituted both branches of the military service have various tests along the line, various opportunities for advancement dependent upon study, good record, and again tests in the way of examinations, and at each one of these tests a certain number of men are eliminated, so that as we go up from the lowest in the ranks to the petty officers and warrant officers we have on the way the constant weeding out process. The same thing, of course, maintains with the commissioned officers—the line officers—only they commence at a relatively higher level and enter the service at a time of life, and after having passed requirements, that eliminate a very considerable number. The man, therefore, who enters upon duty as a commissioned officer is to start with a highly selected individual, as of course he should be. Are there any ways in which we can assist our judgment in the selections which are made as he proceeds from grade to grade in the regular course of promotion?

In the first place I think that we should appreciate that we can not expect to find assistance in a problem of this sort to come to us from the psychological laboratory. It is a psychological problem, true, but one which the laboratory is not equipped to deal with as we ordinarily understand it, at least. Tests of accuracy of perception and of judgment and promptness of response are all very well so far as they go, and I would not for a moment say they were entirely

valueless, but the thing that we want to determine, if possible, is the ability of the individual to meet conditions not as they exist in a psychological laboratory, but as they exist under the stresses of actual war. The object of a military organization is efficiency in time of war, and every effort should be strained to gain efficiency to that particular end. Years of preparation may be necessary for a vital issue that is decided in a few minutes, and it is of course necessary that the particular problems that arise under the terrific stress of actual war conditions should be the ones to arrest attention and meet solution. They are the problems to be stressed and not those that arise under conditions of peace. Now, it is absolutely impossible to reproduce in any way, so far as I know, conditions in the individual which correspond to those that would be produced as a result of actual war. It makes no difference what the individual may test up to in point of accuracy of perception and such similar tests. The whole structure of deductions which might be erected on the basis of such studies might easily and probably would be entirely overthrown by the tremendous waves of emotion to which the individual would be subjected as a result of the horrors of actual warfare.

Having said that I no not believe that the specific problem of deriving psychological assistance for the promotion of officers can be expected from what we understand as the psychological laboratory, I nevertheless have certain quite specific recommendations to make which are based upon laboratory findings, but which are only by implication psychological.

In the first place, such studies as have been made and such statistics as exist indicate, as we might expect, a considerable increase in the number of mental disorders under actual war conditions. Not only this, but they indicate very distinctly that certain latent tendencies are brought to light by these stresses. We find, for example, an increase in the number of alcoholic psychoses, an increase in the number of psychoses due to syphilis of the nervous system, and an increase in the psychosis of metasyphilis, namely, paresis. This does not mean that under stress of war people necessarily drink more or that they have become infected with syphilis. It simply means that out of a considerable number of people who are more or less alcoholic war conditions tend to break down a larger number than would break down in time of peace, and that among a number of people who are syphilitic war conditions tend to break down a greater number than would break down in time of peace. Here, then, we have some actual indications which point the way to eliminating a certain proportion of risk, a certain proportion which I personally do not think is by any means minute, and which, even if it is small, is worth while eliminating, because in this day and age, when the different

nations watch each other with such care, success in war is only going to belong to that nation that has taken infinite pains in preparation; that nation that does not think anything too small to be unworthy of attention; and then, finally, when we think of the possibility of a battleship being led into action by a demented commander, or a company of soldiers being led to the front by an insane officer—and instances of this sort could actually be cited—the possibilities of serious damage to the side upon which such a disaster occurs can be only too readily appreciated.

Certain recommendations stand out from this situation with a fair degree of clearness. In the first place, it would seem to be fairly evident that nobody to whom the term alcoholic could be properly applied should hold a position of commanding importance. Now, this would appear to be self-evident, but there are just a few considerations that I wish to make regarding it. In the matter of alcoholism the so-called habit element is of the very least importance. Men do not drink because they have an alcoholic habit; at least if that were the only reason there would not be very much difficulty about stopping it under conditions of threatened ill health. In general, men drink because of certain necessities which arise within them from time to time and which alcohol meets. They are primarily psychopathic individuals, and it is their psychopathy that is the real danger point in their mental make-up. Such people may drink for years, become alcoholic without perhaps ever showing any considerable signs of intoxication or ever materially shirking their duties, and under the stresses of warfare, not having any margin of energy upon which to draw, break down and develop an alcoholic psychosis. It is this type of individual who is only too frequently hidden behind the man who takes an occasional social drink at the club, and it is important that he should be, as it were, routed out of his hiding place and his make-up understood so that he does not get into a position in which his weaknesses may be an element of danger.

The same comments apply to the syphilitic. Here, however, we have now a well-developed laboratory test, and as a result of that test I think I might put the whole matter in a nutshell by saying that I don't believe any man who has a positive Wassermann reaction ought to command a battleship. You, gentlemen, know better than I do, far better than I do, what it means to get ready to go into action and what actual battle conditions are. I can only say that to me it means days and nights, probably weeks and perhaps months, of tremendous nervous tension, a great strain of both mind and body and the most tremendous demands upon the part of the commanding officers. And if you subject a man to this kind of strain, knowing that he has a serious physical impairment to start

with, why should you be surprised if in the course of it he breaks; and that is precisely what does happen and what will continue to happen, only, of course, it should happen with the minimum frequency.

I have not given any specific facts to demonstrate what I have said about alcohol, because I presume that you are all prepared, at least in a general way, to agree with me. The syphilis question is not, however, quite so well understood; so let me quote you some evidence.

At the Russian Psychiatric Hospital at Harbin, during the Russo-Japanese War, the percentage of paresis among those brought back from the front was 5.6. This is certainly a very significant fact about a disease which we ordinarily think of as essentially deliberate in its course and as having a long prodromal period. It seems evident that its development must have been hastened by war conditions, a conclusion which is borne out and reenforced by the further fact that among the soldiers from the front who were under treatment there were evidences of syphilis in 20 per cent, while among other soldiers under treatment evidences of syphilis were only present in 1.6 per cent. This clearly shows the influence of war conditions upon those who have syphilis; and now that paresis is definitely known to be syphilitic, and the final proof of this has been found by demonstrating the microorganism of syphilis in the paretic brain, the same argument applies to that disease. A further significant observation that fits into these conclusions is that while under ordinary conditions paresis develops only from 12 to 20 years after infection in this class of patients, in those who broke down under war conditions it had developed in from 5 to 10 years after the primary sore.

And now, finally, when we realize that paresis is especially frequent among commissioned officers, not because of a greater prevalence of syphilis, but because they continue in the service until the period when the disease develops; when we further realize that it is a disease that comes at the height of a man's mental development and ability, at the critical period of his career, when, if ever, he is assuming responsible positions of command, it will not be necessary for me further to dwell on its importance or further to justify my somewhat radical statement to the effect that I do not think that any man with a positive Wassermann reaction—in other words, any man with syphilis—should be placed in command of a battleship.

If either one of the conditions of alcoholism or syphilis are serious, then it goes without saying that their combination is doubly so, and particularly in view of the possible etiological relation which alcohol has to the development of paresis. Prof. Kraepelin, in his last edition of his opus magnum, discusses at great length this question, and from his broad experience it is his final conclusion—and he writes with a full knowledge of the relation of syphilis to paresis—it is his

conclusion, I say, that alcoholic indulgence helps to make the way easy for the metasyphilitic processes.

It is but a natural corollary of what has gone before to make a plea for the young man in positions of command. If tangible physical disease that will produce a positive Wassermann reaction is an undoubted predisposing factor to mental breakdown under the stress of war, then is it not equally logical to assume that the changes incident to age, that lessen the elasticity of the blood vessels, the more positive set of character, the disappearing fluidity and adaptability—is it not logical to suppose that all of these things are limiting and crippling, and that, other things being equal, the man of 40 is a good deal safer man on the bridge than the man of 60? Of course, I say, other things being equal, commanding a battleship is something that can not be learned in a minute, nor by everyone, and experience, ripe experience, is required, so that all of the ordinary things and many of the extraordinary things are reacted to automatically, but that does not alter the fact that as the fifth decennium passes and the sixth makes its entrée upon the stage, certain physical conditions come along with it that are not only undesirable but that introduce actual elements of danger, and therefore the best result to be obtained will be the best compromise that can be made between the health and strength and vigor of youth and the experience that comes after long years. Whether it is possible to introduce a more intensive training that will bring about the experience required at an earlier date is a matter that an institution like this, the War College, has to answer.

We come now to a consideration of what Surg. Gen. Stokes very aptly terms "temperamental fitness," and the question at issue is, Are there any available data which can be utilized in determining beforehand whether or not a man will conduct himself with credit under the stress of battle? Secondly, if there are not data for solving this question, in what directions might we expect to get light? As I have already intimated, I can not very well conceive of a more difficult question to place before the psychologist, and if I can not dogmatize regarding it I know you will make allowances for me.

In the first place, in order that we may have a grasp of the way in which we are to approach the problem, the place where we may look with some assurance of finding valuable evidence, we must have some comprehensive understanding of the meaning of mind in the general scheme of things.

We have to consider mind for practical purposes as a complex of adaptive mechanisms, as a series of mechanisms for adjusting the individual to his environment. It is by means of his mind that he comes into adequate relation, into efficient adjustment with the persons and things, with the conditions and the institutions that sur-

round him. This process of adjustment, however, is not entirely a passive process, a process by which the individual is shaped, molded by the things in the world about him, and, so to speak, pressed into shape by them. It has its active side; the individual not only is molded by circumstances, but when circumstances do not suit him he endeavors to react upon the world and change it so as to meet his requirements. There is, therefore, a series of actions and reactions in this process of adjustment and adaptation taking place between the individual and his surroundings.

Now, if we can conceive of this thing we call "mind" as a form of energy and treat it from that standpoint, you will perhaps appreciate the statement that life is keen and satisfying and fulfilling in proportion to the freedom and completeness with which this energy flows in interest into the world. The person who lives most fully is the person whose interests are keenest in the world of reality, in the world of people and things and events with which he is surrounded. These sentences are all very compact and difficult to understand, but I perhaps can illustrate it by saying that we have conditions of mind which I call psychic death, and which are not uncommon in the psychoses. In these conditions the patient has withdrawn all of his interests from the world, and under such circumstances the world no longer looks to that patient like the world with which he was familiar. People and objects have an unreal appearance; persons perhaps look like puppets, animated by concealed machinery, and speak like dolls, mechanically; the world is dead, it is robbed of life because the patient has withdrawn all interest from reality. Such patients develop a series of negativistic delusions to the effect that they themselves are dead; that they have no brains, no heart, etc. This is an extreme instance of what I mean by withdrawing one's self or one's interest absolutely from the world of real things, and is an example I give you so that you will have some appreciation of what I mean when I say that life is at its fullest when one's interests are flowing out most keenly to the world of reality.

We must also consider the individual at any particular moment as an end product. He is what he is because of everything that has gone before in his life. All of his mental experiences have helped to mold and shape him into the form in which we find him; and so at the particular moment that he comes under observation he is the product of all the forces that have acted upon him since his birth, and each one of which has tended to shape him in this or that direction, and each one of which has had to compromise here and there with opposing tendencies.

If we get, then, this comprehension of the mind as a complex of adaptive mechanisms acted upon and being acted upon by the environment, and slowly and gradually from birth onward present-

ing innumerable tendencies which in their interplay produce finally the result as we find it, and as finally making for the keenest life in proportion to the depth of interest which the individual has in the world of real things, we will see that the prime question involved—and after all it is but a truism—is the question of character, only we have envisaged character a little differently from the average way and endeavor to define it in terms of a dynamic and genetic psychology.

As a corollary to these, I am afraid, somewhat obscure paragraphs, I might say that in general the question as to how a man is going to conduct himself under conditions that can not be reproduced in a laboratory, but which are more or less well known, conditions of great emotional stress and horror, the question as to how a man will conduct himself under such circumstances is a question, then, which must be answered by a knowledge of his character, which is the result of detailed and painstaking analysis plus, I think (for comparison), a knowledge of the character of the men who have acquitted themselves bravely and efficiently under such conditions.

A careful analytic study of the character of officers of the Navy coming up for promotion is impracticable. It might be of little or no use in the present state of our knowledge, but the kind of records which are being made with regard to all of these men—the records of temperament and behavior under conditions of stress—are all capable of being read into a general description of character, which is much fuller than anything that has been had heretofore and is decidedly and emphatically a step in the right direction.

A knowledge of the character of the men who have attained eminence as commanding officers from the viewpoint of strict and detailed analytic study does not now exist. However, it is not altogether out of the question to suppose that valuable psychological studies might be made even to-day from the records of our great generals. Personally, I know more of Napoleon than any of the other great leaders of men, and I am sure that I am quite right when I say, going back to my words of a few moments ago, that he lived a life of maximum keenness, of maximum interest in the world of reality. He had a tremendous, an overwhelming ambition toward imperialism; he had a great object toward which he was straining every nerve, every thought, and with that object just ahead of him he went into battle more or less oblivious of the details, no matter how horrid, that were taking place about him. No one ever questioned Napoleon's bravery; he himself never questioned it; he went straight to the goal of his desires, his tremendous ambition, and the things about him fell into their natural places as serving that ambition. That, to my mind, is the keynote of great bravery and great efficiency in Napoleon's military career, and I should expect to find

the same general characters in every brave man. The man who stands upon the bridge of the battleship and wonders whether the next shot is going to hit him or not can not be expected to exercise good judgment in his maneuverings; but the man who stands upon the battleship and is so overwhelmed with the responsibility that rests upon his shoulders to support the honor and dignity of his country that he does not even know that a bullet struck the rail just a few inches from him, that man has his gaze fixed ahead upon an issue toward which he is directed, just as Napoleon did, and he will go toward that issue just as unfailingly.

Can we define any more accurately this character that I have briefly indicated as Napoleon's? I think so. It might be defined as the type of character which was dominated by singleness of purpose. Napoleon's goal was well defined in his own mind. There were no causes for vacillation; the object was clear cut, and his energies were directed, all of them, toward it. Singleness of purpose, that is the keynote to great achievement. Let me give you a remarkable illustration, which I can not vouch for, but which, nevertheless, is quite as good as an illustration. It is told of that remarkable Japanese general, Nogi, whose suicide so recently shocked the western world, that before leaving his home in the recent war to lead his men into battle to fight for his Emperor he submitted himself to all of the ceremonials of death. In other words, he departed absolutely from the life of this world and went forward to do his great duty for his country and for his Emperor without a single drag back upon him from the responsibilities of things worldly. During all of the months that he was at the front he never wrote or in any way communicated with his family. He was dead to the world and lived only with the one great purpose of serving his Emperor with all that was in him. That is what I mean by singleness of purpose. Do you think that such a man as that could be defeated in battle or any other way? He might be killed, but he could not be defeated. There is an ideal of character and of conduct with which to measure, and one by no means that is inapplicable simply because my example is taken from the Orient. It merely happens to be expressed in the symbolism of oriental customs, but it is just as true an ideal to go by for all that.

The antithesis of the character which is dominated by singleness of purpose is the character which we find in the doubter, the man who gets up in the morning and stands for a half, one, or two hours or perhaps all the morning in trying to decide which necktie he will put on. Of course, in such an example as this we are dealing with a neurosis. It is, however, only an exaggerated expression of a characteristic which manifests itself in all sorts of degrees between

the ideal that I have pictured and the neurotic who never is able to decide anything, and therefore remains helpless in inactivity. It is true that the training, the systematic training, which one gets in times of peace, and which makes the machinery of the battleship, and the discipline, the obedience, and all that sort of thing as second nature, brings one into such close adjustment with the necessities of immediate action that action is taken reflexly almost, and a great many of the interferences that might ordinarily come about are thus overcome; and in ordinary circumstances the individual who perhaps has something of such a character as I have described is thus rendered efficient. In the stress of battle, however, we meet with an entirely different set of circumstances. Aside from the disturbing and unbalancing effects of tremendous emotion we have circumstances arising constantly every minute, which never have been adjusted in the calm of peace and under conditions of practice, and it is under the necessity of these new adjustments that all of these disorders arise. Singleness of purpose means being at one with one's self, and if one is not at one with one's self, then under conditions that are unusual and that require new adjustment this lack of harmony inevitably will show itself in a lessened efficiency at least. In proportion as the individual's interests are not concentrated upon a single issue, in proportion as they are distributed in several different directions, just in that proportion is he inefficient in times of stress; just in that proportion is it difficult for him to choose the way to go, because, as it were, all of these paths open before him, all beckon him in their particular way, and he either chooses the wrong path or he hesitates, and though he chooses the right one he does not choose it quick enough.

In this conception we are dealing with mental facts as if with energy, and you will see that the corollary follows, and it is a thing which we firmly believe, that under those conditions of divided interest, such as I have indicated, the individual's store of energy is not fully available. Much of the individual's energy is used in these conflicts in overcoming these internal difficulties, and is therefore not available for the one specific set of actions that he is called upon to perform.

The understanding of the nature of these conflicts and the way in which the individual reacts to them is at the foundation of the understanding of character. Conflict is at the very basis of mental life. When the child first comes into the world it is supreme. Desire hardly exists, because all its needs are anticipated, and so desire, so far as possible, is not permitted to be born. When, however, the increasing complexities of the baby's life make this prescience on the part of the caretakers no longer always possible, the child begins to have needs, to feel desires. With the feeling of a need its immediate

satisfaction follows, almost reflexly, if the means are at hand. There is no thought of others; no thought of anything beyond that of satisfying the desire, whatever it may be. The child is unmoral and absolutely egoistic.

As life goes on—as the child grows from babyhood to childhood, and from childhood to adulthood—conditions become more and more complex. The immediate satisfaction of desire is interfered with by others and such interference is exercised toward others. The give and take, the yielding and compromise of social life take the place of the absolutism of babyhood. Desire still continues, but various interfering and obstructing factors compel its satisfaction to be postponed. The postponement of satisfaction is a distinguishing feature of development, and becomes one of the important requirements of that development, not only from babyhood to adulthood, but from primitive to civilized conditions. Civilization demands an ever increasing postponement of the satisfaction of desire; fulfillment is attained in an ever receding future.

Character depends in very large measure upon the balance that is struck between these opposing tendencies and upon the way in which the individual is able to utilize his energies in relation to these fundamental conflicts. The neuroses and many, at least, of the so-called insanities are, in the main, expressions of failure in just this adjustment. So that it will be seen how important an analysis of the underlying character traits become. I think we, at least, know where to look for the solution of the psychological problem of character, although as yet these problems have hardly been formulated.

Those of you who are familiar with the writings of the great American psychologist, James, know how some years ago he sent forth the theory that few of us were living anywhere nearly up to our possibilities; that all men had reserve stores of energy, and that greatness might very well depend upon the availability of this reserve energy. We all know that under conditions of stress it is frequently astounding what a man will accomplish and what he will stand up under, and we believe that in such conditions he is using his reserve energy. See how valuable it would be if such sources of energy were available, so to speak, at the will of the individual; see how much more of an efficient man he would be. We believe that it is these internal conflicts, these doubts and hesitations and questionings, these wonderings which way to go and how and when to choose, that use up an immense amount of this energy, which with only a single clearly defined purpose at issue could all flow into one channel.

All of these questions involve inquiries into character. I have merely endeavored to outline the general and fundamental principles, of course, without filling in any details for which there is no time in a lecture of this sort. The study of character, however, is in its infancy,

and in its recent developments has largely been concerned with the definition of such traits as might enable one to foretell the type of mental breakdown that a given person would suffer. The principles of character construction, however, have already been somewhat defined, and the work is well under way. It needs only a special application in this particular direction.

One type of character reaction must be mentioned here which is of great importance in considering the qualifications for commanding men. Let me illustrate by an incident. I was able not long since very materially to help a patient. She had come to me timid and afraid, lacking altogether in self-confidence, with no capacity for initiative or self-assertion. As a result of the treatment she came into her own, she learned to know her own true value. One day she came to me very much elated and told me how she had been to several members of her family to tell them certain things about herself with the hope of converting them to her point of view about her life. She was almost astounded to find that in each instance, even when she had supposed she would meet the greatest difficulties, she had carried her point. She explained it by saying, "You see, I carried a message of truth."

My patient, in her experience, had hit upon a great principle. It has to do with a matter that I discussed with Capt. Rodgers when he invited me to give this lecture. We were discussing the reasons for the tremendous influence of such men as Napoleon over their men. How, in a few simple words, he could so wonderfully fire their enthusiasm that they were willing to die for him.

In order to understand how this can be, we have to bear in mind that, contrary to the opinion of the average man, we are controlled in our life and actions much more by our feelings than by our intelligence. If our whole mind were represented by a sphere, our intellect would only be a small bright spot upon its surface, and in all the rest of the sphere the feelings would be dominant. It is the deep underlying emotions, not the surface-lying intelligence, that is most potent. The iceberg is nine-tenths submerged, and it is the ocean currents, often lying at great depths, that control the direction in which the iceberg goes, rather than the winds that only affect the surface tenth. In fact, they may drive it absolutely in the face of the wind, as our feelings may drive us in direct opposition to our intelligence.

The emotions are the common property of all mankind. The intellectual equipment varies within wide limits; and so it is that it is to the emotions that we must appeal in order to secure a concerted action of any large group of men.

The man who bears a message of truth, the man who speaks from the profoundest conviction makes the appeal. No cold, intellectual analysis, no refined diction or flowery rhetoric, no vociferation or

emphasis by loud voice or sweeping gesture can take the place of conviction.

This thesis might be greatly elaborated. Those of you who have read Le Bon know how in his Psychology of the Crowd he expresses it by the statement that a group of men can only come to agreement upon a level that is low enough to be common to them all. Those of you who know Bergson will see reason to believe that we are more closely attuned to the Infinite through our instincts than through our intelligences, while from the standpoint of genetic psychology the intellect appears as an acquirement which is so late and so relatively superficial and unimportant in the great scheme of things that what I have said will receive still further reenforcement.

The commander who would carry conviction to the hearts of his men must himself feel that conviction. To feel that conviction he must be at one with himself, not torn by opposing tendencies, but his whole soul centered on the goal. Such unity of purpose implies a successful handling of the conflicts that I have already called to your attention and is fundamental in character formation.

One other matter suggests itself to me, a matter which is emphasized by the great stress which is being laid recently upon questions of eugenics. It would be interesting to construct family charts and see what are the hereditary probabilities in different individuals. Such charts might, for example, be considered at the time of admission to the Naval Academy, for it would hardly be fair to take them into consideration at a later date; and if out of a number of applicants there were in a certain proportion marked hereditary tendencies which might very well come to expression in the particular individual under consideration, perhaps it would be well to put him aside for one with a clearer family record. I appreciate the danger of attempting to apply any such method as this so far as justice to the individual is concerned, for in the present state of our knowledge these charts, while they serve to make much clearer to us the reasons why certain things have happened to the individual, are proverbially uncertain as a basis for prediction.

In conclusion, I will make several suggestions. In the first place, the data which are being collected and which I have already mentioned might perhaps present some evidence to a person psychologically trained that they would not present to a person without that training. Secondly, a psychological analysis of some of the great generals, I think, is possible from the literature that exists regarding them. This would be an extremely difficult, tedious, and long-drawn-out task, but it is not without precedent, as such analyses have been attempted, particularly within the last three or four years; and I may add that I have just learned that my friend, Dr. Jones, of London, is now at work upon such an analytic study of Napoleon.

Thirdly, I believe field work in psychology is possible. I think it would be an advantageous thing for a person of psychological training actually to be present and make observations under battle conditions. We are all familiar with the writings of the few authors who have attempted to deal with the subject of the psychology of warfare, and they have all been very well summed up in Capt. Eltinge's admirable little pamphlet on the Psychology of War; but I think anyone who reads these discussions feels that after all they only deal with surface indications, and that there is a great mass of information which has not been touched. Such field work is not entirely without precedent. At the recent Messina earthquake psychologists were on the field almost immediately afterwards and reported on the conditions found, while there are statistical studies which tend to show the effect of siege conditions upon besieged people. Fourth, I suggest the application of the principles of heredity in passing upon candidates for the Naval Academy. Fifth, the readjustment of the service, so that men will come into positions of command well before the arterio-sclerotic period; and, sixth, the elimination from promotion to higher grades of alcoholics and syphilitics.

SCHISTOSOMIASIS ON THE YANGTZE RIVER, WITH REPORT OF CASES.

By R. H. Laning, Assistant Surgeon, United States Navy.

The importance of the subject of infection by the *Schistosomum japonicum*, especially to the part of the Navy patrolling the Yangtze River, struck me with full force when seven men aboard the U. S. S. *Quiros* were taken down with it, thus disabling 15 per cent of the ship's force for months. There were several men aboard the U. S. S. *Samar* who were slightly infected during the past late spring and early summer. Moreover, according to civil medical authorities on the shores of the Yangtze, it is not at all an uncommon thing for gunboats of various nationalities to come into port with a fair proportion of the crew completely disabled with the disease.

The naval personnel is more liable to the disease, since it is undoubtedly water-borne, and the men are always more or less in contact with the water while washing down decks and cleaning boats. The disease, however, is not only a menace to the enlisted personnel, but also to officers. Within the past year three officers of the British Navy, with whom I was acquainted, developed typical cases of schistosomiasis and were invalided for varying lengths of time. Especially liable to this disease are those who are fond of following the wily snipe into the infected paddy fields and ponds.

Schistosomiasis is a disease which should be familiar to naval surgeons on account of the likelihood of it being mistaken for some other

disease in the later manifestations as well as the necessity of recognizing it in its earlier stages.

There is on record a civil case which was operated on for carcinoma of the liver—a young man in the second stage of the disease with enlarged liver and anemia—and this was done in a locality where the disease is prevalent.

The fact of the importance of this disease to naval surgeons, the fact that it is a disease the identity of which with so-called urticarial fever and Yangtze fever, has only recently been discovered, are the excuses offered for submitting this article.

Schistosomiasis as it occurs along the shores of the Yangtze River is caused by a fluke, the *Schistosomum japonicum,* inhabiting the portal circulation. Typical cases may be said to be characterized by having three stages: The initial stage, marked by a high afternoon temperature lasting from three to six weeks, a comparatively slow pulse rate, evanescent edemas and urticarias, pains in the abdomen, generally in the upper part, cough with evanescent areas of pulmonary dullness, diarrhea or constipation, marked eosinophilia, and often mental depression. The second stage is marked by enlarged liver and spleen, with a heavy feeling in the upper abdomen, marked eosinophilia and some anemia, loss of weight, slight degree of fever at some particular time of day, passage of blood-streaked mucus containing the ova in the stools, more or less tenesmus and straining at stool, sometimes diarrhea or constipation.

A man generally gets better after several weeks or months in this stage, but may go on to the terminal stage after three to five years, especially if reinfected several times. The terminal or third stage is marked by cirrhotic liver, sometimes enlarged, sometimes shrunken, ascites, edematous extremities, marked emaciation, anemia, weakness, passage of blood and mucus in the stools, and sometimes a little fever. The man may die of exhaustion or of some terminal infection.

The history of this disease may be divided into two parts: That in which the parasite and ova were discovered in late stages of the disease, and that in which a certain disease of unknown etiology occuring on the shores of the Yangtze River and called urticarial fever by Lambert, of Kiukiang, China, was found to be due to the *Schistosomum japonicum.*

For the first part of the history I quote from Manson's Tropical Medicine:

For some years Japanese physicians had observed in the Provinces of Yamanashi and Hiroshima, in central Japan, and at Saga in the North Island, an endemic disease characterized by enlargement of the liver and spleen, cachexia and ascites. The patients suffered from diarrhea, and their stools contained mucus tinged with blood. Occasionally they had fever. They became anaemic, and many of them died of exhaustion. At the autopsy the liver and other organs were found to contain the ova of some unknown helminth. As far back as 1888 Majima, in Tokyo, found pecu-

liar ova in the liver of a case of cirrhosis. These he described as the ova of an unknown parasite. In 1890, in a similar case, Yamagiwa found ova which he ascribed to the lung trematode.

In April, 1904, Katsurada discovered that the eggs found in the stools of these patients contained a ciliated embryo not unlike the miracidium of *Schistosomum hæmatobium*. Disappointed of an autopsy, he examined dogs and cats in the endemic area, and had the good fortune to find at once in the portal system of two cats from the Province of Yamanashi numerous Schistosomidæ containing eggs exactly similar to those previously found in man. He published this information on August 13, 1904, and named the new trematode *Schistosomum japonicum*.

Almost simultaneously and independently Fujinami observed cases of the disease in the village of Katayama, in the Province of Bingo, and found in his first fatal case the characteristic ova in various organs. In the second necropsy, besides the ova in the liver, intestinal wall, and mesenteric glands, he found in a branch of the portal vein a parasite which he regarded as *Schistosomum hæmatobium*. In November, 1904, Catto discovered the same parasite in sections of the mesocolon from a Chinaman of of the Province of Fukien, who died of cholera at St. Johns Island, quarantine station, Singapore.

In March, 1910, Lambert of Kiukiang published an article on "Urticarial fever" in the Transactions of the Society of Tropical Medicine, London, giving a very full account of the symptoms with a report on a series of cases in foreigners. At that time no one could suggest any cause. Later in the same year Houghton, formerly of Wuhu, China, and now of the Harvard Medical School at Shanghai, suggested that a case of urticaria with fever occurring at Kuling might be due to schistosomum infection. The stools of the case were examined and many eggs found. Not long after this in the same year Lambert of Kiukiang examined the stool of one of the cases reported in his paper on "Urticarial fever" in the Transactions of the Society of Tropical Medicine of March, 1910, and found the characteristic ova. About the same time Thompson and Aird of Hankow had several acute foreign cases, in one or two of which eggs were found. The first case described as occurring in an European was one by Skinner, then of Hankow, viz, that of a Spanish priest. Since these findings all the medical authorities along the Yangtze have been on the lookout for the disease.

For a description of the parasite I can not do better than quote from Manson's Tropical Medicine:

The *Schistosomum japonicum* closely resembles in general structure *Schistosomum hæmatobium*.[1] As in the latter, the suckers are placed close together at the anterior extremity of the body, the acetabulum or posterior sucker being distinctly pedunculated and funnel shaped. The suckers in both sexes and the central surface of the body in the male are provided with minute spines. The distinctive characters of the new trematode are its smaller dimensions (9 to 12 mm. in length, 0.4 mm. in breadth) and the larger size of the acetabulum as compared to the oral sucker. In the male the integument is smooth and nontuberculated, and the posterior part of the body in the male is relatively wider, with sides overlapping one another far more extensively than the *Schistosomum hæmatobium*. Finally the ova (70 to 75 μ in length,

[1] See Fig. 1.

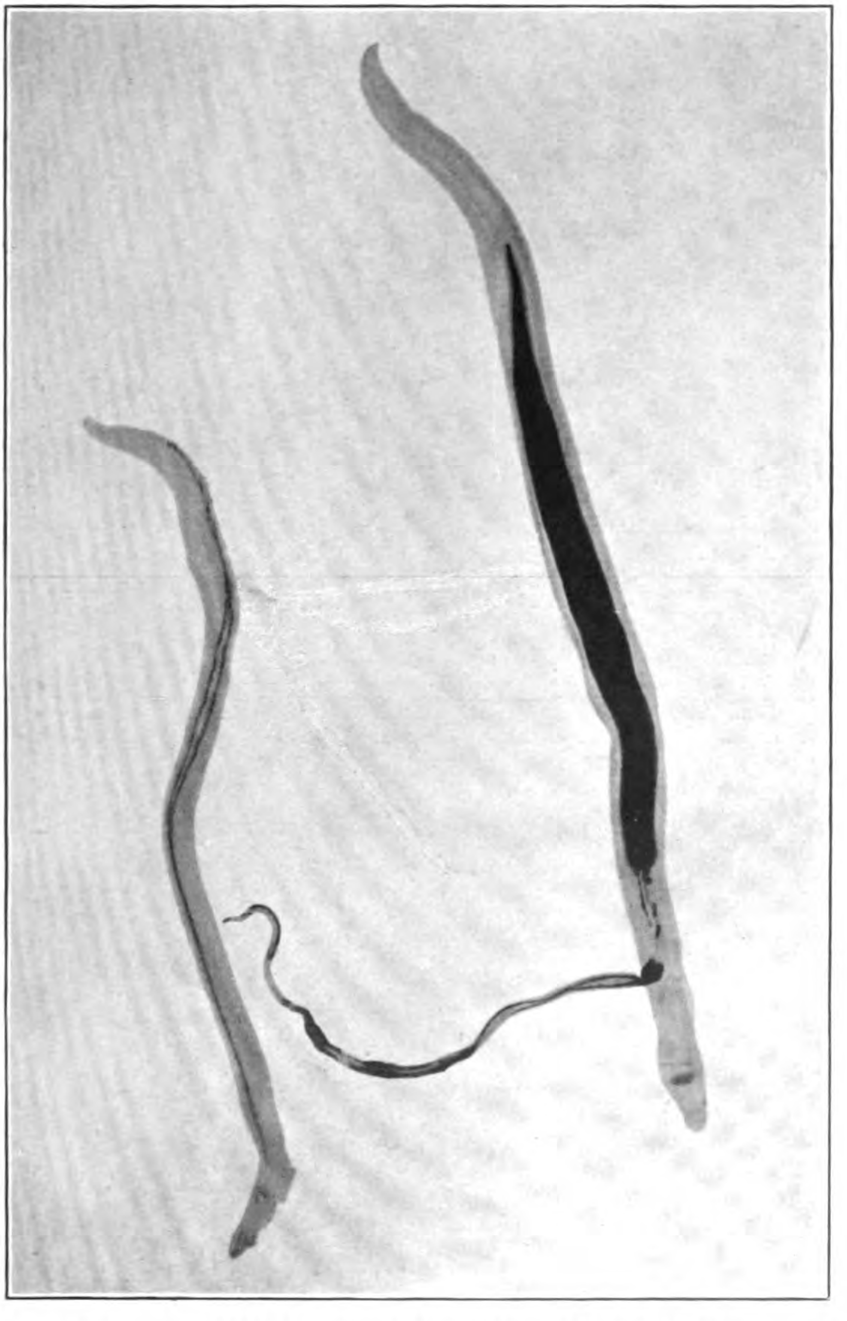


FIG. 1.—SCHISTOSOMUM JAPONICUM, MALE AND FEMALE.
(Photograph by Houghton.)

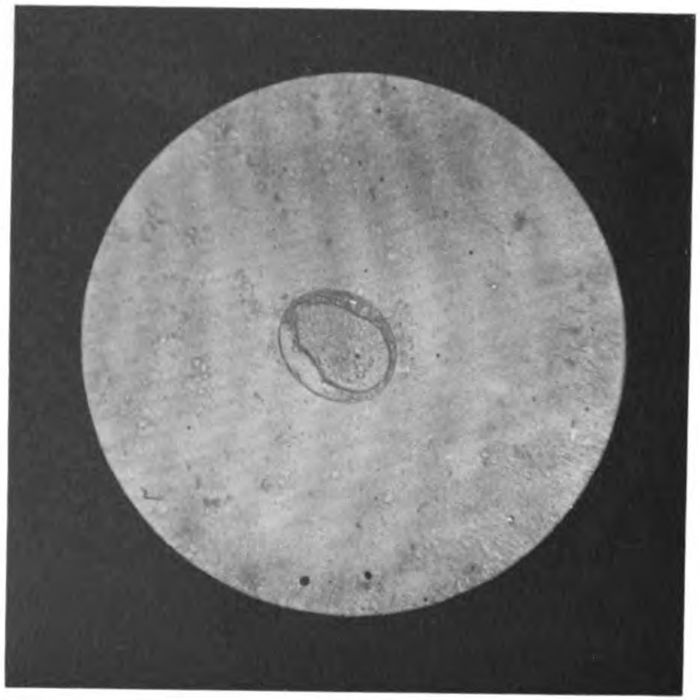


FIG. 2.—OVUM OF SCHISTOSOMUM JAPONICUM.

FIG. 3.—OVUM OF ANCYLOSTOMA DUODENALE.

(Photographs by Thompson, Hankow.) Same magnification.

45 to 55 μ in breadth) are smooth and possess no spine. A comparative study of the two Schistosomidæ will probably show other morphological differences. Catto mentions a larger vas deferens and lobular testicles in the male and a different arrangement of the yolk cells in the female. Looss notices a greater development of the muscular system in the male *Schistosomum japonicum*, which he thinks may take the place of the want of cuticular eminences.

Catto found the adult worms in the smaller mesenteric blood vessels, but he was unable to determine whether they occupy the arteries or veins. He believes they occur in both. The smooth, nontuberculated skin of *Schistosomum japonicum* seems to suggest a different anatomical habitat to that of *Schistosomum hæmatobium*, the integument of which is beset with numerous spine-bearing protuberances.

Little is as yet known of the life cycle of this parasite. Houghton, of the Harvard Medical School, Shanghai, is now working on the subject. Katsurada has already shown that the parasite does not enter the body of its host through the mouth. This he proved in the following way: He took several cats, tied up their mouths, and immersed them in infected paddy fields. They contracted schistosomiasis. He then took some miracidia and showed that they could not live in a solution of HCl of the same strength as that in the human stomach. Of course it has not been proved that the miracidium stage is the one in which the parasite is infective, so that some doubt may be thrown on this latter experiment. Houghton, with a view to finding out whether the miracidium stage is the infective one and the time when evidence of infection appear in the liver, took six small kittens and immersed them in a bath containing large numbers of miracidia. He sectioned the whole liver of all the cats; one, a week after immersion; a second, two weeks after immersion; and a third, three weeks after infection, and so on. He has not yet made microscopical examinations of his sections, but told me that the livers macroscopically looked healthy. Houghton says that his experiments show that the eggs of *Schistosomum japonicum*, when put into water at about the temperature of pond water during summer weather on the Yangtze, hatch out in from 10 to 48 hours. Thompson, of Hankow, told me that he has seen the miracidium escape from the shell while looking at a specimen made by putting a bit of the blood-tinged mucus in a drop of water and placing on it a cover slip.

The ovum of *Schistosomum japonicum* is about 0.101 mm. by 0.075 mm. The shell is fairly thick, and the noticeable feature of the embryo is the snoutlike projection at one end. For purposes of comparison I append two microphotographs by Thompson, of Hankow, one of *Schistosomum japonicum*, and the other of *Ancylostoma duodenale*. (See figs. 2 and 3.)

As far as it is known at present, schistosomiasis intestinalis is confined to certain limited areas in Japan and to the Yangtze River basin. Phalen and Nichols, of the Army, have reported a case which they think was contracted in the Philippines.

Along the Yangtze, the localities in which the disease is most prevalent, are the more or less stagnant waters, draining paddy fields and other places where a teeming population deposits its excreta. A most fruitful supply of cases always exist about Kiukiang and the Tungting Lake about Yochow and Changsha. The accompanying map, taken from Jefferys and Maxwell's "Diseases of China" (fig. 4), shows how generally distributed the disease is along the Yangtze. Even the mountain waters of Kuling do not seem to be free from the infection. The case of Hoy reported by Logan became infected there. My own cases on board the U. S. S. *Quiros* became infected at Yochow and Changsha on the Tungting Lake.

This disease is of immense economic importance to China, as I have the word of Houghton, who no doubt is the best helminthologist in China, that in one Province alone thousands die yearly by this disease, with other thousands incapacitated by it.

The exact mode of transmission of schistosomiasis is not fully understood. It is not known whether the miracidium is the infecting stage or whether there is a further stage in a cycle of development such as is seen in parasites of an allied kind in crustacea and mollusca before the infecting stage is reached. Katsurada has shown that the infection does not enter through the mouth. There are those that believe the infection enters through the anus. In support of this view is the fact that in the majority of cases, at least those reported in foreigners, the men have been either waders after snipe and have been in the water above the hip or else have been in bathing. On the other hand, one of my cases aboard the U. S. S. *Quiros* who contracted the disease gave absolutely no history of having come in contact with infected water except through the feet and hands.

The cough of the early stage of the disease, with evanescent areas of pulmonary dullness as reported in Lambert's cases and as observed in my own cases, although ascribable to the same thing that causes the evanescent urticarias and edemas of the early stages, would at least suggest a mode of infection similar to that of the hookworm. Moreover, several of my cases gave a history of early morning hemoptysis in the early stage, which also, of course, is suggestive of some sort of lung involvement during transit of the parasite to the portal system.

On the whole, the cutaneous method of infection seems to be the most plausible. It would appear that those who wear heavy clothing over the parts of the skin exposed to infection do not become infected.

The study of the morbid anatomy of schistosomiasis intestinalis in man has been more or less limited on account of the difficulty of getting autopsies in Chinamen. Katsurada, Catto, Thompson of Hankow, and Phelan and Nichols, of the Army, have reported autopsies in human beings. A portion of the liver of the cases

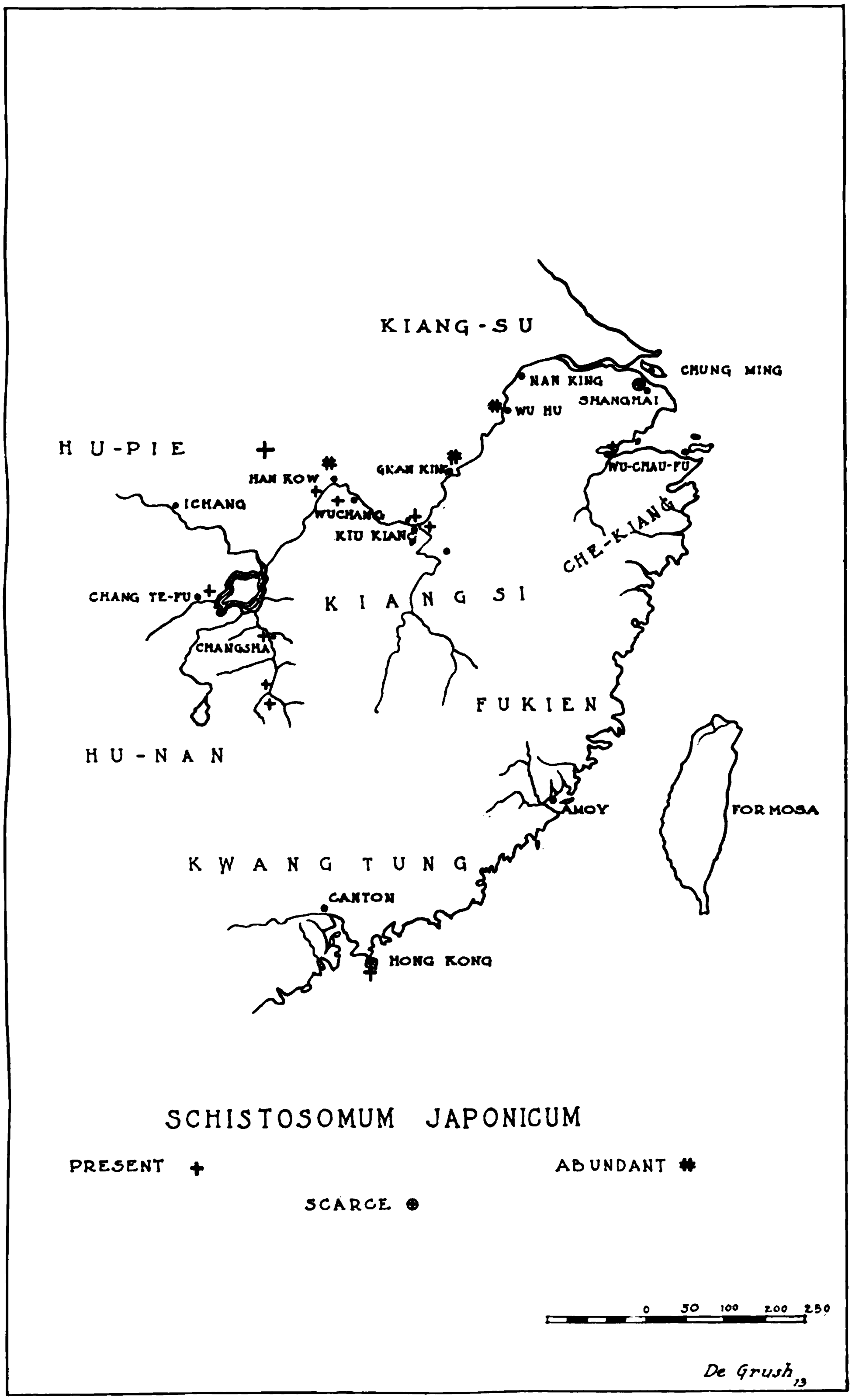


FIG. 4.—(AFTER JEFFERYS AND MAXWELL.)

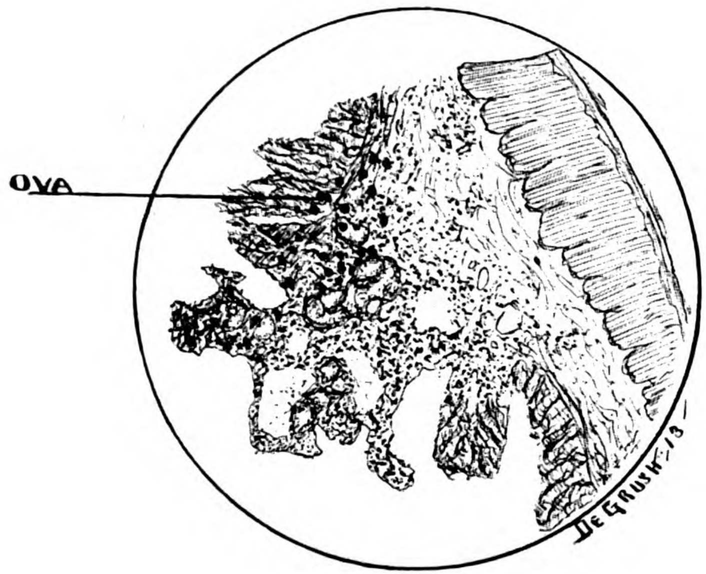


Fig. 5.

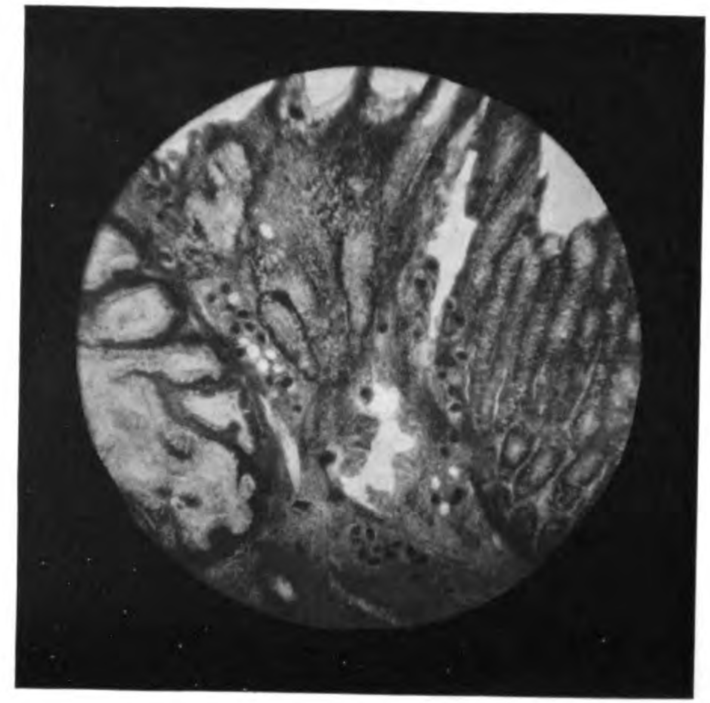


Fig. 6.—(Photograph by Thompson, Hankow.)

OVA OF SCHISTOSOMUM JAPONICUM IN INTESTINE OF MAN.

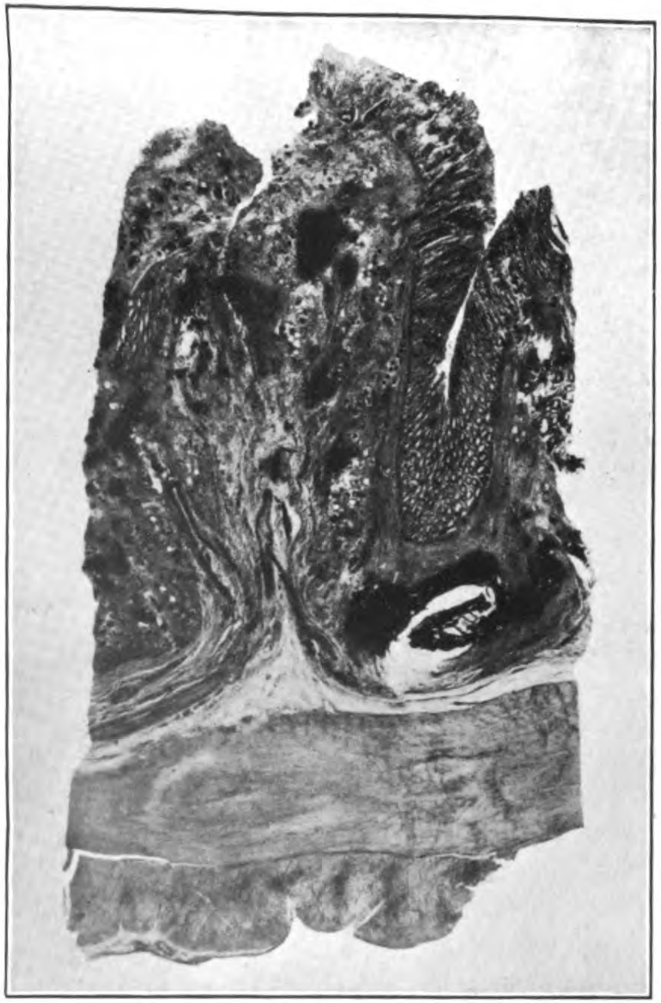


Fig. 7.—(Photograph by Houghton, Shanghai.)

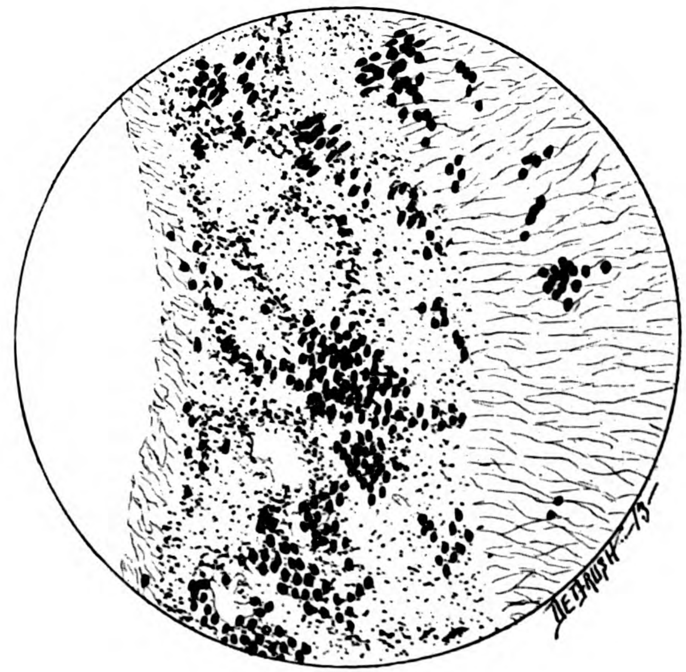


Fig. 8.

OVA OF SCHISTOSOMUM JAPONICUM IN INTESTINE OF DOG.

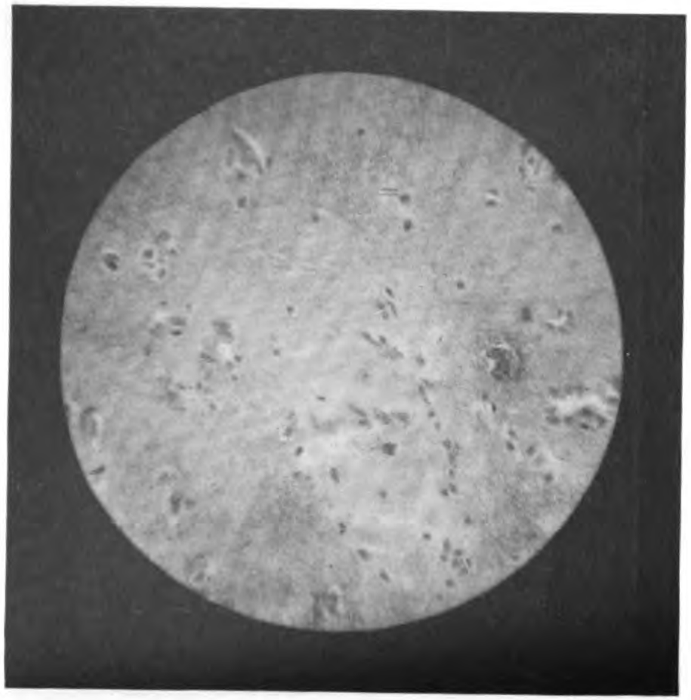


Fig. 9.—(Photograph by Thompson, Hankow.)

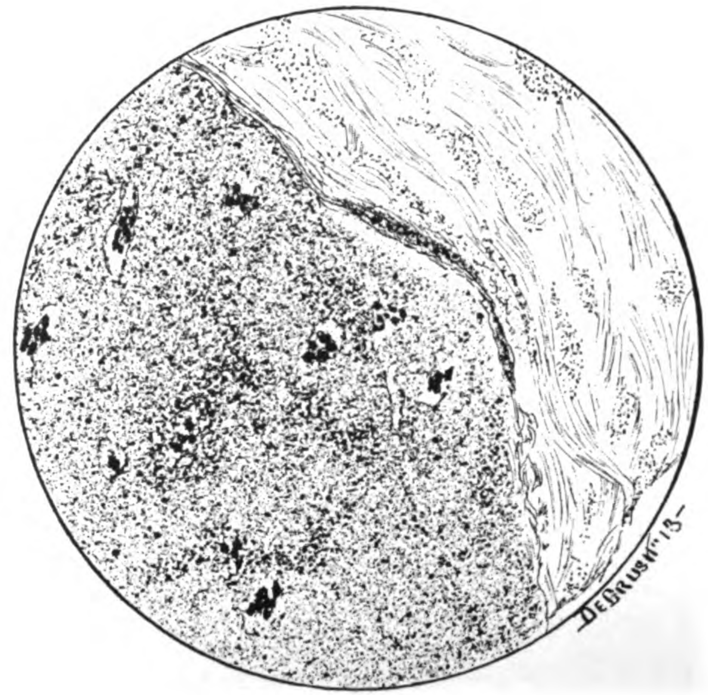


Fig. 10.

OVA OF SCHISTOSOMUM JAPONICUM IN HUMAN MESENTERIC LYMPH NODE.

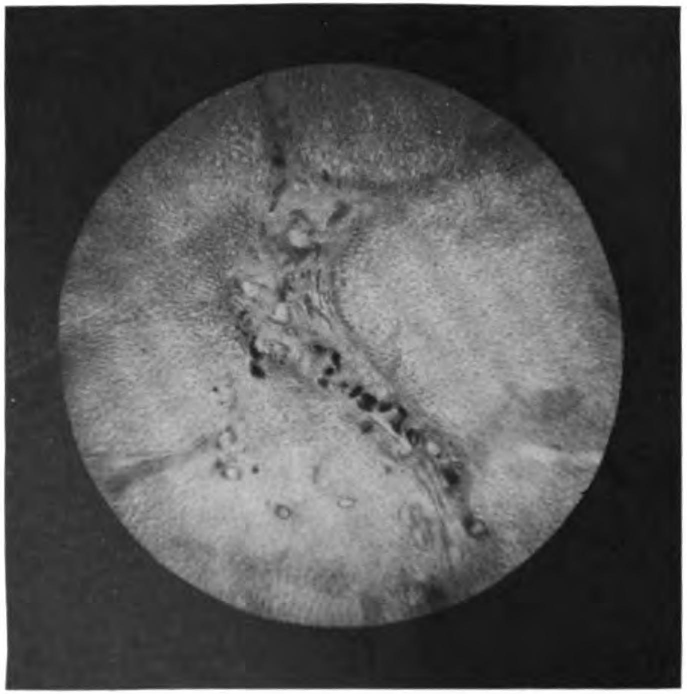


Fig. 11.—(Photograph by Thompson, Hankow.)

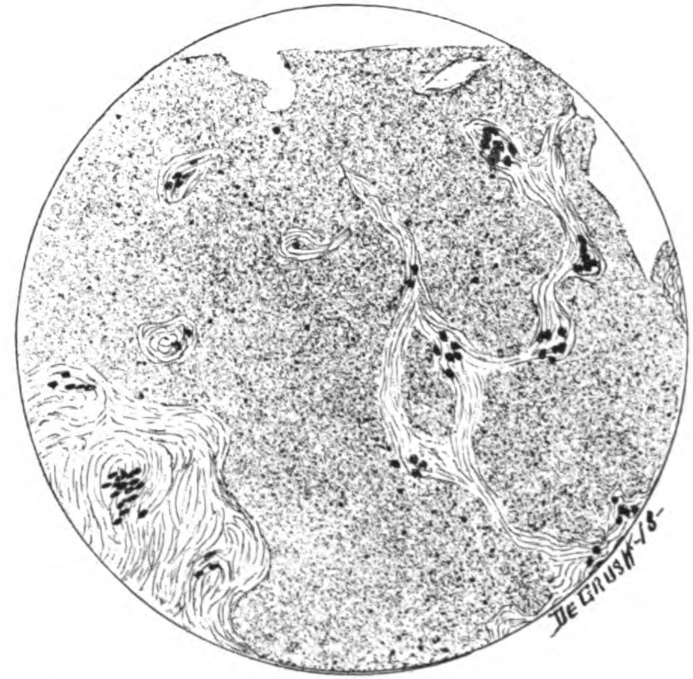
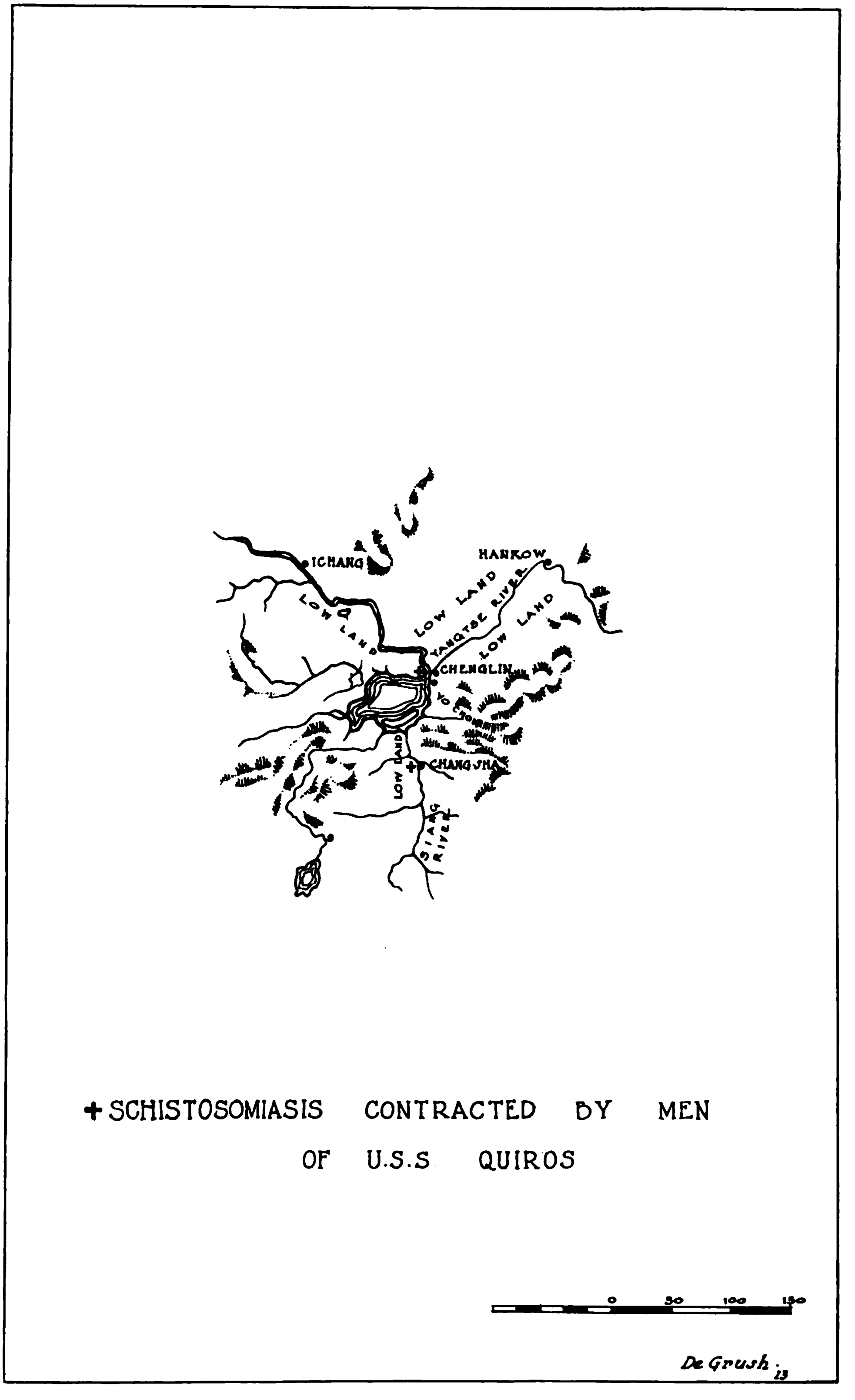


Fig. 12.

OVA OF SCHISTOSOMUM JAPONICUM IN INTERLOBULAR CONNECTIVE TISSUE OF HUMAN LIVER.



ICHANG
HANKOW
LOW LAND
LOW LAND
YANGTSE RIVER
LOW LAND
CHENGLIN
CHANGSHA
LOW LAND
SIANG RIVER
+ SCHISTOSOMIASIS CONTRACTED BY MEN OF U.S.S QUIROS
0 50 100 150
De Grush '13

Fig. 13.

reported by Thompson of Hankow has been forwarded to the Naval Medical School, having been given me by Dr. Thompson. A fruitful supply of pathological material can, however, be obtained from infected dogs and cats, which are the only two animals known to become infected.

The post-mortem appearances in Catto's case, as given in Manson's Tropical Medicine, were as follows:

The appearances of the peritoneum suggested repeated attacks of peritonitis. The appendices epiploicæ were thickened and in some places matted all together. The rectovesical pouch was almost obliterated. The mesenteric and prevertebral glands were enlarged, the largest group forming a cluster near the duodenum. The liver was considerably hypertrophied, its surface nodular, its consistence greatly increased. The coats of the gall bladder were thickened and a layer of fat almost completely incased this organ, which was distended with clear, mucoid material containing several minute black gallstones. The spleen was enlarged and pigmented. The colon was much thickened throughout. Its mucous membrane was swollen, hyperæmic, and friable; it presented numerous small, circular, superficial erosions and patches of necrosis. The outer coats were very tough, almost cartilaginous. The wall of the rectum was three-fourths inch thick and adherent to the bladder; it nearly filled the true pelvis. The sigmoid flexure also was uniformly thickened. In tracing the bowels upward the thickening became less marked and more patchy.

The liver and bowels cut gritty on section. The bladder was thickened where adhesions had formed with the rectum, but elsewhere it was healthy and nowhere was the vesical mucosa diseased.. Section of the liver, mesenteric glands, and bowel were found to contain the ova of *Schistosomum japonicum*.

A brief description of Thompson's autopsy is as follows:

1. An enormously distended abdomen containing about 30 pints of chylous fluid.

2. A shrunken, cirrhotic liver, tough and of a grayish-purple color, which on section showed numerous white areas of variable size from a pinhead to that of a 20-cent piece.

3. Dense cartilaginous thickening of the walls of the large intestine and wartlike growths of its mucous membrane, but no ulceration.

4. Enlargement of all the peritoneal glands, forming large tumorlike masses along the spine and in the caecal region. A similar tumorlike mass could be distinctly felt after tapping the subject.

5. Microscopical ova were found abundantly in the liver and in the peritoneal glands, numerous but not so abundant in the submucosa of the bowels. See figs. 5, 6, 7, 8, 9, 10, 11, 12.

The cirrhotic areas in the liver contained numerous scattered ova, and a section of what appeared to be a portion of the adult worm. In the less cirrhotic areas small collections of ova could be seen everywhere between the lobules as if the terminals of the portal vein were occluded by them (fig. 11).

In a case from Katoyama in Bingo, Japan, described by Tsunoda and Shimamuda, the necropsy revealed, besides the ordinary lesions in the liver, etc., thickening with hemorrhagic infiltrations of both

the dura and pia mater. In the brain itself a number of wedge-shaped sclerosed areas of grayish color and surrounded by ecchymoses were found. In the lenticular nucleus, optic thalamus, and internal capsule of the left side there was an area of softening the size of a walnut. On histological examination these areas were found to contain ova embedded in neuroglia and surrounded by softened and degenerated brain tissue. Similar ova were found in the membranes and a few in the right hemisphere and in the choroid plexuses of the lateral ventricles. In connection with these lesions the patient during life suffered from disorder of speech and tremors in both upper and lower extremities with headache and mental disturbance, later from vertigo and Jacksonian fits (two or three a day) and finally from right hemiplegia.

As seen by these pathological findings the most constant changes and the most characteristic are an interlobular cirrhosis of the liver, a thickening of the walls of the intestine, and an enlargement of mesenteric lymph nodes and spleen.

Thompson thinks that the true pathology of the disease is an embolic process, ova constituting the emboli. He states: "The ova are much more in evidence than the adult worm, and from the manner in which they are seen to lodge in the terminals of the portal vein it would seem that they have been carried there by the upward current of blood; but the fact that the ova are so numerous in the lymphatic glands would lead me to suppose that certain of the adult worms must be lying in the tissues and not in the veins. How would worms confined solely to the radicles of the portal veins in the intestines account for ova being liberated into the bowels, for these ova are seen in the stools at an early stage of the disease, long before symptoms of portal stasis occurs?"

Katsurada and others think that the hepatic cirrhosis is due to the irritation of the ova, whereas Phelan and Nichols think it is due to toxins liberated by the parasite.

From an examination of pathological slides it would seem that the manner in which the eggs are discharged into the intestinal lumen is as follows: A mass of ova collects in the lymphatics of the intestinal submocosa. This causes a pressure necrosis of the surrounding tissue and the mass of eggs is extruded into the bowel lumen. (See fig. 7, by Houghton.) This accounts for the fact that ova are very often not found in the stools for a long period of time, and then again will be discovered in a bit of blood and mucus in large numbers.

The incubation period from the time a man is exposed to infected water to the time the invasion starts with the temperature, etc., of the first stage of the disease seems to me to be fairly clear in my seven cases on board the U. S. S. *Quiros*. From June 14 to June 28, 1913, the ship was at Kiukiang. We were then anchored in mid-

stream and the current was quite swift, and the only way in which the men came in contact with river water was when washing down decks. That anyone should contract the disease under such circumstances is more than unlikely. The ship left Kiukiang on June 28, 1913, and arrived in Hankow on the next day. Here, too, we were anchored in swiftly running water, and the only way in which the men came in contact with the river water was when washing down decks. On July 11 the ship left Hankow for Yochow and arrived there the day after. We stayed there till July 15, when we left for Changsha. (See fig. 13.) These two places, Yochow and Changsha, are undoubtedly where seven men contracted intestinal schistosomiasis. Yochow is on the Tungting Lake and Changsha on a tributary to it, the Siang, and at both places the water at this time of year is practically still.

The Tungting Lake is about 75 miles long by 60 broad in summer, while in winter it is a marsh through which flow several streams. In summer the overflow of the Yangtze flows into it forcing back the waters which it receives from the Siangkiang and its affluents, making the whole practically a stagnant pool. On arriving in Yochow word was given out that no swimming would be allowed, and the place was known to be heavily infected with *Schistosomum japonicum*. Later, however, it was discovered that the day after arrival in Yochow several of the men, including one or two who later came down with schistosomiasis, had sneaked off and gone swimming in a pool "beautifully clear and still." According to the medical authorities of the Tungting Lake shores the water at a distance from the beach would not be dangerous, so the decks were washed down every morning. Moreover, several men let their legs hang in the water while cleaning the side of the ship. On July 15 three men developed typical symptoms of incipient schistosomiasis, though I did not recognize it for four or five days, besides one other, a rather dubious case, which proved later to be schistosomiasis. The day after arriving in Changsha another clandestine swimming party was formed. In addition to this, men were sent ashore to clean boats without my knowledge. Between 24 and 48 hours afterwards another group of cases came down with the characteristic symptoms.

These cases would seem to show that the incubation period is between 24 and 48 hours. As far as I know this is the only series of cases where the symptoms were observed from the start and from which a definite history could be obtained. There have been various surmises as to the incubation period being anywhere from 12 days to a month; but they were nothing more than surmises on account of lack of cases which have been under observation from the start and which could give definite histories.

With regard to the symptoms produced by an infection with *Schistosomum japonicum* it might be said that they are far from constant, as with most other diseases; but on the whole they may be divided into those belonging to three stages: The first stage or the period of invasion is before the ova begin to appear in the stools, and lasts from one to six weeks. The second stage is between the time the temperature of invasion abates and the ova begin to appear in the stools to the time that ascites, due to great impairment of the liver functions, appears. If a man is not reinfected in this stage, it would appear that he rarely goes on to the third stage. It lasts as a rule for three to five years before the third stage supervenes. The third stage is when the liver becomes so greatly impaired as to lead to ascites, edema of the extremities, and perhaps general anasarca. Great emaciation and weakness supervene. The third stage is fatal and the patient dies of exhaustion or some terminal infection in the course of several months.

For a description of the first stage we can not do better than take the description of urticarial fever by Lambert, of Kiukiang, which he afterwards proved was infection by *Schistosomum japonicum*, as given in the Transactions of the Society of Tropical Medicine and Hygiene, April, 1910. He says:

> Premonitory symptoms, if present, are headache and malaise, with perhaps slight cough and an evening rise of temperature to 100° to 102° F.[1] In some cases there are definite gastric symptoms, vomiting, diarrhea, and epigastric pain, for two or three days before the rash makes its appearance.
>
> In mild cases the rash is the first sign that the patient notices. This eruption, unlike that of most pyrexial states, is of an urticarial type. It appears in any part of the body as a small wheal which rapidly assumes a large size, attaining frequently 3 inches to 4 inches or more in diameter. These wheals are firm, white, and raised from the surface, feeling to the touch like a solid edema, and having frequently a central purplish areola. They remain out for an hour or two, continuing to spread. As they disappear the central part first resumes the normal skin appearance, the areola fading last of all, so that on examination of the patient one finds the patches in all stages of development from the early wheal as large as a sixpence to sinuous raised, red lines, the outline of former areas, some of which measure several inches in circumference.
>
> The eruption may continue to appear and fade away and reappear again for a week or more. It leaves no mark or trace behind it and does not avoid parts of the body that it previously favored. The patient may be practically free from it for many hours, when it again makes its appearance with renewed vigor. The irritability of the rash varies considerably; but, taken generally, is not so annoying as that of simple urticaria. It is frequently noticed that when the rash is well out the patient feels better, although there may be no remission of his fever at night. Dermatographic wheals can be elicited in many cases.

One of my cases had evanescent edemas of uvula and larynx. Another had subcutaneous edemas in various portions of the body.

[1] In some of my cases the evening temperature went up to 104° F., but the extremely hot weather undoubtedly had something to do with it.

which the patient called his "bumps." This latter patient's penis was one morning swollen and twisted with edema as if he had a very acute gonorrhea. This, however, disappeared over night.

The temperature is normal or but slightly raised in the mornings. It commences to rise about noon and reaches its height, which is seldom above 102° F.,[1] about 6 in the evening, from thence gradually falling to normal, its decrudescence being accompanied usually with sweating. The presence or absence of the rash has no effect on the temperature, which may continue for days after all signs of the former have disappeared.

The pulse rate, taken as a whole, is comparatively slow, and in some cases is below normal, even when there is fever present. In an average case it may be expected to be from 60 to 70 in the morning and from 75 to 85 at night. There is nothing special to be noted as to its volume or regularity; it does not become dicrotic, but if abnormally slow may intermit.

The effect of the disease on the respiratory passages is most important, particularly important from the point of view of diagnosis, as the symptoms referable to these parts may be assigned to other causes, such as tuberculosis, pneumonia, pleurisy with effusion, or empyema.

The urticarial rash frequently appears on the mucous membrane of the buccal cavity, also on that of the nose, in the latter position causing temporary impediment to respiration through the nostril, the blockage passing off to the accompaniment of a profuse discharge of watery fluid. The larynx may also show the transient edema, but never, so far as is known, to a dangerous extent, the slight embarrassment to respiration caused by the swollen mucosa soon passing off. So far as the lungs themselves are concerned, the principal symptom is cough accompanied by more or less secretion. This may be distressing to the patient, coming on in paroxysms at irregular intervals and heralded by tightness in the chest, but it is the physical signs which trouble the practitioner. Perhaps on his first examination he finds dullness over one or other base and hears a fine crepitant râle, which makes him think of pneumonia. Possibly the rash has not yet made its appearance and the patient does not seem ill enough for an incipient pneumonia, so he is put to bed, and the diagnosis left in abeyance for the present.

The following day the rash may be out, and the patch of dullness in the lungs may have quite disappeared, the air entering freely. The attendant, glad that he has not committed himself, begins to hedge and directs his attention to the alimentary tract. If, as is possible, there is anorexia or diarrhea and vomiting, he thinks he may say "ptomaine poisoning," and probably does so. After a day or two, the patient in the meantime having been treated *secundem artem*, attention is again directed to the respiratory tract by a return of or, if it were never entirely absent, by an increase in the cough. Further examination of the chest reveals a new area of dullness involving, perhaps, the whole of one lung; the breath sounds are distant and fine crepitations again heard. The respiratory rate is not, however, increased to the extent to which one would expect from the physical signs. A day or two more is allowed to elapse before another change in diagnosis is made, when, to the surprise of the examiner, he finds, in listening to the chest, that the lung, which the evening previously was apparently out of commission, is now admitting air freely, while the opposite organ is in the same condition from which its mate has emerged, though a few hours before it appeared to be healthy. And so it will go on from day to day, in spite of the treatment, to the wearying of the patient and the driving of the doctor to despair.

In some cases the symptoms are distinctly more gastric and intestinal than pulmonary. All types suffer from anorexia and furred tongue and in most of the gastric

[1] In at least half of my cases it was above 102 ° F.

forms examination of the lungs will show areas of dullness and some amount of cough will be present, but diarrhea and vomiting are more marked in some cases than in others, while some may require treatment for constipation.

A steadily increasing eosinophilia is encountered from the commencement. It reaches a high degree, in one case to 40 per cent.[1] The eosinophilia gradually disappears as normal health is regained. There is always a certain amount of anemia present, which increases if the case is a prolonged one; it is not uncommon to find the red cells reduced to 3,500,000 after three weeks of fever. At first there is a leucocytosis, but later, even with the eosinophilia, the leucocytes may be reduced to 6,000 or 4,000, the brunt of the decrease falling on the polymorphonuclears. The urine is of the usual febrile variety, diminished in quantity, with high specific gravity and increased urates. There was no albumen present in the samples from our cases. In several cases the spleen was found to be palpable. The liver in one case was said to be colored.

The duration of cases of this type of fever varies considerably. In the milder sort the fever has disappeared at the end of a week or 10 days, the patient regaining his health at the end of a month. In all cases convalescence is comparatively protracted and in the severer types in which the fever lasts from three weeks to a month, restitution to complete health may be delayed for two or three months after the fever has disappeared. In those cases the temperature about the end of the second or third week begins to fall by lysis, the morning temperature being sometimes below the normal. Frequently when the temperature has reached as low as 99° in the evening it will remain at that level for days at a time.

In the second stage of the disease—that is, after the temperature comes down to nearly normal and eggs begin to appear in the stools—the symptoms may be divided into those of convalescents and of those who go on to the third stage of the disease. It would seem that as a rule if a fairly healthy man contracts the disease and does not become reinfected he becomes his normal self again in the course of a few months. In that case the slight degree of evening temperature gradually disappears, the eosinophilia becomes less and less marked, the appetite becomes very good, the slight anemia and emaciation disappear, the bowels gradually become normal, and blood and mucus gradually case to appear in the stools. In the event the case goes on to the third stage the liver and spleen continue to enlarge, the eosinophilia persists, the appetite may get poor; he has slight febrile attacks; attacks of dysentery with blood and mucus in the stools which contain eggs, and pain and tenesmus at stool; he becomes more and more emaciated and weak; his lassitude, mental depression, and inability to think or work increase. These symptoms go on for two, three, or five years until ascites and perhaps general anasarca begin to make their appearance, when the third stage may be said to commence.

Perhaps the most common stage in which Chinamen with schistosomiasis are seen by the foreign medical man is the third stage. See figs. 14, 15, 16. In the early part of the third stage the liver and spleen are enlarged, but as the cirrhosis progresses the liver

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[1] One of my own cases had an eosinophilia of 85 per cent.

Fig. 14.

Fig. 15.

ADVANCED STAGE OF SCHISTOSOMIASIS.

(Photographs by Thompson, Hankow.)

FIG. 16.—ADVANCED STAGE OF SCHISTOSOMIASIS.

often becomes shrunken. As this stage is reached the dysenteric symptoms abate and in their place is an irregular diarrhea with a little blood-streaked mucus containing ova, but without pain or straining. The stools are fairly copious and contain large amounts of undigested food. Practically all patients complain of dyspeptic symptoms, but the appetite is good and the tongue usually clean. The ascites gets worse and worse and general anasarca supervenes. The liver and spleen are often quite tender to the touch. The countenance is seen to have a listless, wearied expression. There is extreme weakness, lassitude, and disinclination, even disability, for physical or mental exertion. The patellar reflex is sluggish. The emaciation in this stage is extreme. The sleep is much disturbed by nightly recurring fever and restlessness. The temperature is usually subnormal, but rises to 101° F. or more during the night fever attacks. There is marked eosinophilia. The man may linger on and die of exhaustion or he may die of some terminal infection.

With this disease, as with most others, there are, of course, atypical forms. In the first stage there may be cases with no rash or edematous swellings. Then again, especially in light infections, one may have the urticarias and edemas but very little fever. Houghton says that one may get cases with very little eosinophilia; but this is almost always present, as far as my knowledge goes. Houghton says that in one district around Kiukiang, China, almost every male native has ova in his stools. Of course, it is theoretically possible for one schistosomum to infect a man and the symptoms then presumably would not be very severe, and yet he might show the ova in his stools. It seems that, differing with the individual in one case, one set of symptoms predominates, while in another case another set predominates. The most typical case reported is that mentioned above, with pathological findings in the meninges, the symptoms of which have been mentioned.

As the ova do not appear in the stool much before the third week, the diagnosis in the first invasion stage rests largely on the probabilities of exposure, the typical rash, the high evening temperature with attendant constitutional symptoms; the morning feeling of comparative well-being, and last but perhaps most important and constant, eosinophilia. When the ova are found, then of course the diagnosis is clinched. The ova may, however, appear in the stool once and not again for a comparatively long period of time. The part of the stool to examine for the ova is the bit of mucus and blood which often tops the stool; here they may be found in great numbers, if present.

In the earlier stages the disease is frequently taken for pneumonia or influenza on account of the respiratory symptoms; or again it may be mistaken for typhoid or paratyphoid on account of the

intestinal symptoms, and in the later stages it may be taken for filariasis, intestinal tuberculosis, some abdominal neoplasm, ancylostomiasis, cirrhosis of the liver due to some other cause, such as alcohol, tropical splenomegaly, or chronic malaria. Finding the characteristic ova is, of course, the crucial differential test.

As the number of cases of schistosomiasis intestinalis which has been followed through the course of the disease is quite meager, the prognosis to be given in this disease is not a very easy thing to decide. I, however, knew several white men in Hankow who had the malady a couple of years ago, and they seem to be in normal health, with no trace whatever of their former illness. They all recovered gradually in the course of a few months, not progressing beyond the second stage of the disease. The Chinamen who come into the foreign clinics along the river in the late second or third stages of the disease, although it is difficult to get a definite history, have continued to live in such surroundings and circumstances that reinfection by the parasite would not only be probable, but almost certain. Moreover, the only two reported cases of the disease in foreigners who continued for any length of time in the second stage of the disease were undoubtedly reinfected. So that it would seem that a man in normal health contracting the disease will probably be feeling fairly normal within six months, although, most likely, some irreparable damage has been done to his liver.

If a man, however, by repeated infection, gets into the late second and third stages of the disease, it might be said that there is no hope for him. Some people think that the severity of the disease can be prognosticated by the degree of eosinophilia at the commencement of the disease, i. e., the higher the eosinophilia the more severe the infection and vice versa. This, however, would not seem to be correct, since one of my cases which had the most severe illness had one of the lowest eosinophile counts. It might, however, be the case that, taken two cases with equal body resistance to the disease, the degree of eosinophilia is a gauge of the infection.

The prophylaxis of the disease naturally divides itself into ridding infected districts of the disease and of preventing the entrance of the infecting agent into the human body. Probably the only way the former thing could be done would be to stop the fertilizing of the fields with human excreta and the establishment of sanitary privies similar to those established by Stiles in the hook-worm ridden districts of the United States—a measure, by the way, almost impossible in China. In addition to this, infected dogs and cats would have to be destroyed. To prevent the entrance of the infecting agent into the human body, the part of the skin coming in contact with infected water must be covered with very thick-meshed material. In case part of the skin has come in contact with infected water,

washing soon after with strong formaline solution might help. The only safe way, of course, is to keep out of infected water.

There seems to be no specific treatment for the disease so far. Some men advise arsenic in some form, others emetine, others felix mas, others santonin, others urotropin. In my seven cases I tried the injection of 0.6 gram of salvarsan intravenously and per rectum without results, another with urotropin, grains XL t. i. d., with plenty of water, another with santonin with equal results. I gave two men felicic acid in maximum doses—one by bowel and another by mouth—but symptoms of intoxication supervened, so it was stopped.

The treatment would seem to be to keep a case in bed for the first few days on a liquid diet until the primary gastric disturbance has passed, then to get him on a moderately light diet as fast as possible and keep the bowels well open. The rest is symptomatic. My patients said that if they did not get their salts regularly the pain in the upper abdomen was worse. They can sit around the ward in the mornings before the afternoon fever comes on, but during the period of invasion they should not walk about much. The second stage requires tonics, rest, and change of climate.

The treatment for the third stage is the same as for cirrhosis of the liver from any other cause.

I am greatly indebted to the following doctors for their valuable assistance, advice, and interest: Dr. Lambert, of Kiukiang, Drs. Thompson and Aird, of Hankow, and Dr. Houghton, of Shanghai. I am also indebted to the hospital apprentice, De Grush, aboard the U. S. S. *Quiros*, for the sketches, and to hospital apprentice, Selden, of the U. S. S. *Saratoga*, for his clerical assistance.

CASES WHICH OCCURRED ABOARD THE U. S. S. QUIROS.

On July 28, 1913, the U. S. S. *Quiros* was ordered away from Hankow, and Dr. Aird very kindly looked after these cases for me for the next two weeks, until the ship returned.

Case 1. B. L. M., B. M., 1st Cl.—On July 17, 1913, this man was sent out to clean the ship's boats on the beach, and at that time he waded about in the water, most of the time above the waist, for three-quarters of an hour. He also had been in contact with the infected water of Tungting Lake from July 13 on while washing down decks. On July 22 he reported at the sick bay and stated that he had been feeling feverish and weak in the late afternoons for the past four days; in the mornings he felt fairly well. The patient's temperature was in the neighborhood of 103° F. that afternoon. He complained of abdominal pain, particularly in the hepatic region, and a dry hacking cough. A blood examination made July 24 showed an eosinophilia of 60 per cent.

On the strength of the eosinophilia, the comparative well-being of the morning compared with the evening, the hepatic pain and tenderness, the history of exposure and the concurrent outbreak of typical cases of "urticarial fever" on the ship, a diagnosis of schistosomiasis was made, and on arrival in Hankow the patient was admitted into the International Hospital together with six other men.

They were all put on a soft diet, increased according to the individual appetite, with a dose of Epsom salts every other morning. Those who felt able were allowed to sit up in the mornings. The patients were all glad to get their salts, as they said it relieved the hepatic pain and tenderness. As no specific remedy is known, it was proposed to try different drugs in each case. This man was given salvarsan in the following manner: On the evening of July 26 the patient was given a good purge and enema. On the following morning he was given pulv. opii., gr. 1, on an empty stomach. An hour later 0.6 gm. of salvarsan dissolved in 200 c. c. of 5 in 1,000 NaCl solution was injected and the patient was kept in bed with nothing to eat for 12 hours. This salvarsan enema was retained and presumably all absorbed. For 12 hours or so after receiving this injection the patient's condition became somewhat worse; he had a bad headache, felt nauseated and weak to a greater degree than before. During the patient's stay in the hospital his appetite was good, but he felt weak and languid. By August 5 the liver was enlarged five finger breadths below the infracostal margin. The spleen also was somewhat enlarged. Before coming to the hospital the stools were somewhat diarrheic, but during his stay in the hospital they became formed, except when salts were administered. They were often capped by blood-tinged mucus.

On August 7 a differential blood count gave the following results: Polynuclears 41 per cent, eosinophiles 54 per cent, lymphocytes 3 per cent, and mononuclears 2 per cent.

The hepatic pain together with a sense of heaviness in that region continued throughout the patient's stay in the hospital, although that feature, as well as his well-being and looks, improved gradually until his transfer to Cavite, P. I., on August 23. The ova were never discovered.

Case 2, G. L. M., O. S.—On July 17 this man was cleaning the ship's side for a considerable part of the morning, and at intervals he would take a little dip in the clear, still water. He was in contact with the water while washing down decks for several days before and after this date. He reported at the sick bay on July 22, saying that he had been feeling ill in the late afternoons for the past three or four days. He complained of what he called his "bumps" which he had had for the past couple of days. These bumps were deep, raised subcuta-

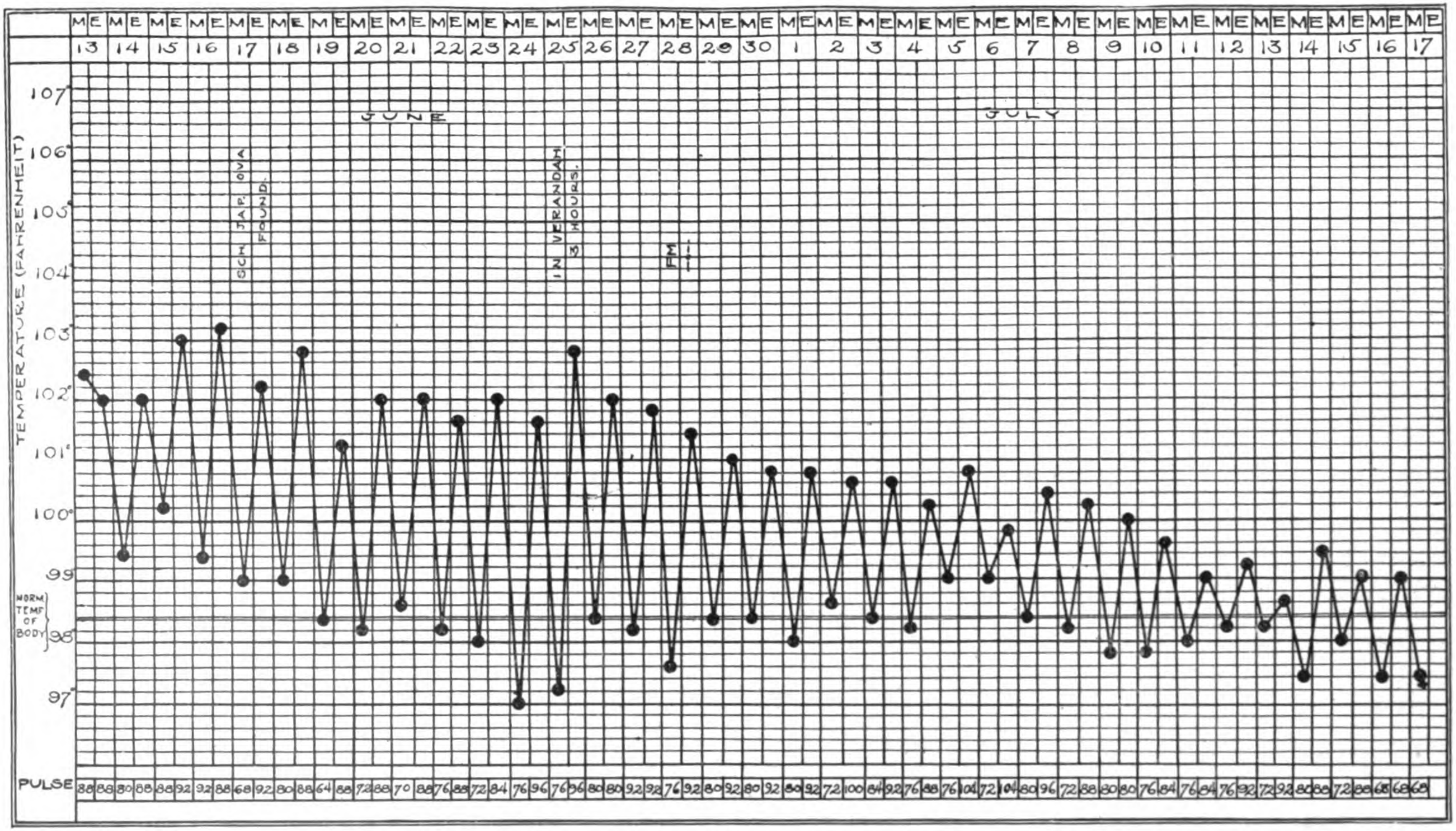

FIG. 17.—TEMPERATURE CHART, CASE OF SCHISTOSOMIASIS.

neous edemas occurring especially on the arms and legs, appearing and disappearing generally within 12 hours and approximately one-half to 1 inch in diameter. These lasted for about a week. On the morning of July 23 his penis was swollen and distorted with edema as if from a violent gonorrhea. By next morning, however, the penis was perfectly normal again.

For about six weeks the patient had a dry hacking cough. He had pain and tenderness in the upper part of the abdomen, and at the start the stools were somewhat diarrheic. The appetite at the start was somewhat impaired, but it soon improved considerably. The patient felt fairly well in the mornings, but in the late afternoons, weak, languid, dizzy, and feverish. On July 24 a blood examination showed an eosinophilia of 65 per cent. On the strength of the above symptoms the diagnosis of schistosomiasis was made and he was admitted to the International Hospital on arrival in Hankow.

The patient was put on the same general line of treatment as the preceding case. On July 27 he was started on santonin grs. V once daily, and this was continued until symptoms of poisoning supervened some four days later, when it was discontinued. On July 29 an examination of the stool showed it to be dark, of almost normal consistency and plentiful in ova of *Schistosomum japonicum*. During his stay in the hospital the patient continued to feel weak and languid in the afternoon and had a tired droop of the eyelids. He continued to have more or less pain and tenderness in the hepatic region, and the liver and spleen were both perceptibly enlarged by August 6.

A differential blood count taken on August 7 gave the following findings: Polynuclears, 14 per cent; eosinophiles, 76 per cent; mononuclears, 2 per cent; and lymphocytes, 8 per cent.

On August 23 the patient was transferred to the U. S. N. A. *Ajax* for further transfer to Cavite.

Case 3, D. C. McN., O. S.—This man was in swimming contrary to orders on July 16 for about three-quarters of an hour. He was also out cleaning the ship's boats on the beach on the same date. He came in contact with the lake water every morning while washing down decks from July 13 until put on the sick list.

On July 19 this patient reported at the sick bay with large urticarial eruptions on the inside of the legs and the arms, and said that for the past two days, as evening came on, he would feel sick, feverish, weak, very nervous, and sleepless. He felt fairly well in the mornings. The urticarial areas would appear and disappear inside of 12 to 24 hours. In addition to this urticaria, the patient would have evanescent edemas of the uvula, pharynx, and larynx, as well as of the lips and cheeks. The stools were diarrheic. He had a considerable amount of pain and tenderness in the hepatic region and a hacking cough at some time of day which lasted as long as the

patient was under my care. The sputum later on was muco-purulent, and at times tinged with blood.

On July 24 an examination of the patient's blood showed an eosinophilia of 13 per cent, with an abnormally large percentage of lymphocytes. A diagnosis of schistosomiasis was made and the patient so admitted to the International Hospital on arrival at Hankow.

The same general line of treatment was followed as in the aforementioned cases. On July 27 the patient was started on felicic acid grs. XV once daily, but this was discontinued on the third day on account of spmptoms of poisoning. The urticaria was abundant until about August 2. He suffered a great deal with headache until August 3. The hepatic pain and tenderness was so great at times that opium had to be administered. It was always the worst when the patient was constipated. Between July 30 and August 3 four doses of emetine gr. ½ were administered without any appreciable effect. By August 6 the liver was considerably enlarged, but no appreciable splenic enlargement was present.

A differential blood count on August 7 gave an eosinophilia of 39 per cent.

The patient was transferred to the U. S. S. *Cincinnati* on August 17. From there he went to the United States Naval Hospital, Cañacao, P. I., where I hear he was still suffering with weakness, languor, and hepatic pain and tenderness on September 17.

The ova of *Schistosomum japonicum* were never found in this case.

Case 4, R. Z., O. S.—On July 15, while cleaning the ship's side, this man got into the still, cool water of Tungting Lake above the waist, then took a swim. He also was in contact with the water from July 13 on, while washing down the decks. He reported to the sick bay in the evening of July 18 with oedema of the eyelids and lips, pains in the arms and legs, headache, pain in the upper abdomen, persistent hacking cough and a temperature of 104° F.

The difference in the patient's morning and evening condition was very marked.

He felt miserable in the late afternoon, and fairly well in the morning. The cough was so persistent that at times it induced emesis. The stools were somewhat diarrheic.

A blood examination made on July 24 showed an eosinophia of 55 per cent and on arrival in Hankow the patient was admitted to the International Hospital with schistosomiasis.

The same general line of treatment was followed as in the other cases. On July 16 the patient was given 15 grains of felicic acid by the mouth, followed in the evening by a purge and an enema. On the next day 15 grains of felicic acid in olive oil was administered by rectum, being preceded by 1 grain of powdered opium. The same

dose was repeated by mouth the following day, but symptoms of poisoning supervened so this treatment was discontinued.

On August 3 the stool showed large numbers of ascaris eggs, but no schistosomum ova, and santonin grs. V was administered on three successive evenings.

On August 7 the ova of *Schistosomum japonicum* were found in large numbers in the stool. The liver and spleen by that time were enlarged. A differential blood count on this date showed the following: Eosinophiles, 66 per cent; mononuclears, 20 per cent; polynuclears, 20 per cent; lymphocytes, 5 per cent.

The patient was transferred on August 23.

Case 5, C. A. C., O. S.—This patient was ill for some days with diarrhea and indigestion, pain in the hepatic region and slight hacking cough. Together with these symptoms was a jaundiced tint of the ocular sclera and also weakness, dizziness, and languor, especially late in the afternoon. The patient did not report to the sick bay until July 24, and stated that he had been feeling ill for four or five days. He gave no history of having come in contact with the waters of Tungting Lake except when washing down decks from July 13 on.

A blood count was attempted on July 24 and the eosinophiles were seen to be increased, but the actual count was of little value on account of the lack of white blood cells. The diagnosis of schistosomiasis was made and he was admitted to the International Hospital on arrival in Hankow.

The same general line of treatment was followed as in the other cases. No special treatment was tried in this case. While in the hospital the indigestion, cough, hepatic pain, and tenderness continued as well as the slight jaundice, weakness, and languor.

On August 7 a differential blood count showed the following results: Eosinophiles, 13 per cent; polynuclears, 65 per cent; mononuclears, 5 per cent: and lymphocytes, 17 per cent.

The patient's condition improved slowly. There was no apparent enlargement of the liver or spleen. This was the only one in this series of cases in which the diagnosis was doubtful, either in my own mind or in the mind of the local doctors. No ova were found up to the time the patient was transferred on August 23, 1913.

Case 6. M. M. N., O. S.—This man reported to the sick bay on July 18, 1913, with an afternoon temperature of 102° F., slight cough, somewhat diarrheic stools, pain and tenderness in the upper abdomen. He said he felt dizzy, weak, and feverish in the late afternoon, but fairly well in the morning.

The patient denied ever having gone in swimming in the Tungting Lake, but others on the ship state that he was in swimming on July 13. He, however, came in contact with the waters of Tungting Lake

while washing down decks from July 13 until put on the sick list. He began to feel ill the afternoon of July 15. He at no time had any skin manifestations.

A blood examination on July 24 showed an eosinophilia of 30 per cent, which, together with the above-mentioned symptoms and the presence on the ship of typical cases of "urticarial fever" led to the diagnosis of schistosomiasis, and the patient was so admitted to the International Hospital, Hankow.

This case was put on the same general treatment as the others. On July 25 he was put on urotropin grs. XL t. i. d., with a glass of water every half hour to counteract its irritating effect on the urinary passages. On August 3 the patient had some haematuria, so that the urotropin was discontinued. While in the hospital the cough continued and the stools became somewhat constipated. By August 6 the liver and spleen were noticeably enlarged. A differential blood count on August 7 gave the following results: Eosinophiles, 82 per cent; polynuclears, 15 per cent; mononuclears, 2 per cent; and lymphocytes, 3 per cent.

No ova were found at any time before the patient was transferred to the U. S. N. A. *Ajax* on August 23.

Case 7, H. E. W., O. S.—This man began to feel feverish and ill on the afternoon of July 14. From the morning of July 13 he came in contact daily with the waters of Tunting Lake while washing down decks. On the 16th while at Changsha he was in swimming for about half an hour, contrary to orders, and by the evening of the following day he was feeling much worse. He reported to the sick bay on July 18 with an evening temperature of 104° F., pain in the upper abdomen, slight cough, marked weakness and languor, and the following skin manifestations: Large wheals on the inside of the thighs and forearms, which would come and go within 12 hours, and œdematous swellings of the eyelids and pharynx. He had evanescent areas of dulness in the lungs, with cough for some days. The patient's appetite was poor and continued so for three weeks. The skin manifestations lasted about two weeks. The weakness and dejection of spirits in this case were marked for four weeks.

On July 24 an examination of the patient's blood showed an eosinophilia of 50 per cent. A diagnosis of schistosomiasis was made and the patient admitted to the International Hospital, Hankow. He was put on the same general line of treatment as the other cases. On July 27 he was given 0.6 gm. salvarsan intravenously. That night he passed blood by the bowel and in the sputum, felt very ill, and his pulse became somewhat feeble. The hemoptysis and melena stopped next day and the patient recuperated. The stools contained mucus and sometimes blood, but no ova were ever found. No enlargement of liver or spleen was detected.

On August 7 the differential blood count showed polynuclears 43 per cent; eosinophilia 43 per cent; mononuclears 2 per cent; and lymphocytes 12 per cent. By August 23 the patient had regained his normal appetite, was more cheerful, and had regained considerable weight. He was yet quite weak and below normal weight at this date when he was transferred to the U. S. N. A. *Ajax*.

The urine of all these cases was negative for sugar and albumen, and nothing was found in the sputum of those with a cough.

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A BRIEF DISCUSSION OF MATTERS PERTAINING TO HEALTH AND SANITATION, OBSERVED ON THE SUMMER PRACTICE CRUISE OF 1913 FOR MIDSHIPMEN OF THE THIRD CLASS.[1]

By J. L. NEILSON, Surgeon, United States Navy.

For many years it has been the custom in the Navy of this country to send midshipmen upon a summer cruise for the purpose of giving them practical training in the life at sea and the profession for which they are studying and to introduce them into the mysteries of a fighting ship.

During the entire period extending back to the Civil War there have been practically no records kept of these cruises dealing with the subject from a medical officer's point of view. The result has been that the members of the Medical Corps who have been assigned to this duty have all taken it up either without knowledge of, or with only an inkling of, the special conditions that exist. Further, the Bureau of Medicine and Surgery, the naval Secretary's advisor on matters pertaining to health, has been shut off from any accurate source of information relative to this particular portion of its field of activity and has had to depend upon verbal reports or suggestions and its general knowledge of naval conditions.

At the Naval Academy the problems of sanitation relating to the care of the health of these future naval officers, who are being educated at great expense to the Government, have received the most careful consideration, and the results of observations by medical officers conveyed to the bureau in the form of written reports have had a large share in bringing about the vast improvement which has taken place in the last few years; yet each summer these same young men, for a period of three months, pass beyond the reach of this well-ordered system prepared especially for their benefit, and are cared for under the general rules adapted for the service. Fortunately the

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[1] This article was accompanied by several elaborate and valuable tables which it was found impracticable to publish—Ed.

latter are on so high a plane as almost to fulfill the demand perfectly; but inexperience, lack of established customs and policies have led to confusion in adapting them to this peculiarly constituted body, with resulting eliminations or variations that have reduced their efficacy.

The hope that a full statement of conditions observed this year on the summer practice cruise for midshipmen of the third class may lead to further investigations which will redound to the benefit of the midshipmen and aid medical officers who are assigned to this duty in the future is the only excuse for the preparation of this paper.

The U. S. S. *Illinois*, a battleship of the second line, built in 1900 and having a displacement of 11,552 tons, was selected for this year's trip, and the choice proved a wise one for several reasons. Her construction is such as to provide ample space for both midshipmen and crew and still have these two bodies of men well separated and distinct. She is also steady at sea, which is a comfort to those who are having their first experience with an ocean swell; further, all her compartments are well ventilated, even when she is battened down for bad weather. This latter condition is due to the fact that all the intakes for the systems of artificial ventilation supplying the living spaces are upon the bridge deck or superstructure, which is not the case in the more modern naval vessels, where perforations of armor and water-tight bulkheads are reduced to a minimum. A few changes were necessary to fit her for this duty, the most important of which were the installation on the berth deck of a separate scuttle butt for the crew, the establishment of a midshipmen's wash room in the junior officers' mess room, and placing of salt-water showers on the superstructure deck.

The personnel was made up of 21 commissioned officers, 5 warrant officers, 16 midshipmen of the first class, 209 midshipmen of the third class, and 350 enlisted men. The fact that the main deck was reserved entirely for midshipmen limited the crew to the berth deck and such other spaces on the superstructure deck and below as were available, and it was plainly evident that the number on board (350) occupied all this room. Fifty more midshipmen could have been carried easily, and even a total of 300 could have been cared for, but any increase over that number would undoubtedly result in overcrowding and discomfort.

The midshipmen were embarked June 7 and disembarked August 26, upon the completion of the trip, and it was the general opinion that a better itinerary could not have been chosen as far as climatic conditions were concerned, although an exact reversal of the program during this particular summer might have resulted in the avoidance of the only unfavorable influences encountered, namely, excessive heat and humidity on the return trip and the cold wet, weather at Antwerp,

Belgium. A table appears below showing the ports visited, the time consumed, and the distance covered:

Ports.	Date of arrival.	Date of departure.	Distance covered.	Days at sea.	Days in port.
			Miles.		
Annapolis, Md		June 8, 1913			
Antwerp, Belgium	June 23, 1913	July 8, 1913	3,970.3	15.5	14.5
Vigo, Spain	July 12, 1913	July 15, 1913	899	3.5	3
Cadiz, Spain	July 17, 1913	July 26, 1913	463	2	9
Gibraltar	July 26, 1913	July 30, 1913	82	.25	4.25
Funchal, Madeira	Aug. 2, 1913	Aug. 6, 1913	613	2.5	4.5
Hampton Roads, Va	Aug. 19, 1913	Aug. 20, 1913	2,986	12.5	1
Annapolis, Md	Aug. 25, 1913		142	[1] 5	
Total			9,155.3	41.25	36.25

[1] The time elapsing between Aug. 20 and Aug. 25 was spent on the southern drill grounds at target practice and in Chesapeake Bay, and, as there was only communication with the shore when absolutely necessary, the time is credited under "Days at sea." The "Distance covered" does not include the run made during target practice.

The extremes of latitude were north 51° 26′ and north 32° 26′, a difference of only 19°, and the lowest registered temperature was 49° F., the highest 94° F.

The first leg of the trip, that from Annapolis to Antwerp, and the time spent in the latter port, covering a period from June 8 to July 8, was (with the exception of a few scattered days of sun) cold, foggy, and rainy throughout. In fact the stay at Antwerp, so far as weather was concerned, was quite disagreeable, as the sun appeared for only a portion of three days, and the remainder of the time it was either raining or heavily clouded. The association of a nearly continuous high westerly wind with the dampness intensified what under other circumstances would have been but an agreeable coolness. The westerly wind, blowing as it did from the river across the ship to the shore had one advantage, as no dust was carried from the quay onto the ship, which would have been the case had the wind been in the opposite direction. It was while in this port that the lowest temperature mentioned was recorded.

One day before reaching Vigo, Spain, the clouds cleared away, and from that time until August 26 an unbroken period of sunny weather was enjoyed, with the exception of a storm of 36 hours' duration and a few showers while in Madeira. In Cadiz, Spain, the highest temperature mentioned above was recorded, but the dryness of the atmosphere prevented this heat from being felt to any extent. The run from Funchal to Hampton Roads showed an average high temperature of 86° F., with a variation of only 10° between that and the average low temperature. Owing to the persistent rather high temperature and the oppressiveness of associated high relative humidity and light airs the heat during this period was felt more than at any other time, with the exception of one of the days spent in Chesapeake Bay, where the discomfort reached its maximum intensity.

All the ports visited were free of diseases in epidemic form, and sanitary conditions, while far from perfect at some ports, were not such as to be a menace. As a result, no restriction of liberty by reason of health conditions was necessary, and the general information circulated throughout the personnel regarding care in partaking of uncooked food and promiscuous drinking of water was deemed sufficient precaution.

The health of the personnel was remarkably good, there having been but a small loss to the Government by reason of sickness and treatments, and only two serious cases. No epidemics occurred and not a single case of contagious disease appeared.

It is believed that the freedom with which the privileges of money and liberty were granted to the crew and midshipmen had much to do with the good health by establishing a condition of mental contentment and comfort, and it is gratifying to note that there was practically no effort on the part of either group to "hit the list" unnecessarily. One case only appeared which could manifestly be classed under the heading of "temperamental unfitness."

For the entire personnel the admission rate per 1,000 was only 15.30. The average number of sick days for each individual of the entire complement was 1.13, and the average number of days each case was treated amounted to 7.43.

From among the commissioned and warrant officers, who numbered 26 in all, only 1 was placed on the sick list and there were but 2 or 3 who suffered from minor ailments.

A detailed account of the health of the midshipmen and crew appears in Table A, and a summary of the same, with derived data, appears in Table B. Since midshipmen and crew were living under practically identical conditions, these tables are instructive.

In explanation of Table A, the following remarks are appropriate:

The diseases and groups of diseases selected for headings are chosen simply to meet the requirements of this cruise and do not conform to the grouping used in the bureau's statistical tables of occupational diseases. "Treatments" indicates the number of individuals who, by reason of minor ailments, received medical advice. The numbers given stand only for the original prescribing and for changes in treatment and do not include those who reported from day to day for observation and to carry on treatment already prescribed. (This statement is not absolutely correct, as some treatments were recorded in error a second time, owing to loss of treatment slips or when reporting for observation. This is especially true of skin diseases.) Also it does not include those admitted to the sick list.

Table A.

	Digestive disturbances.	Skin diseases.	Venereal diseases.	Dental affections.	Ear affections.	Eye affections.	Tuberculosis.	Tonsillitis.	Colds.	Seasickness.	Miscellaneous.	Sprains.	Contusions.	Abrasions.	Wounds.	Fractures.	Heat affections.	Total.
MIDSHIPMEN.																		
June:																		
Admissions	2	....	....	....	....	....	....	....	1	....	....	....	1	....	2	....	....	[illegible]
Readmissions	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
Sick days	4	....	....	....	....	....	....	....	7	....	....	....	5	....	5	....	....	[illegible]
Treatments	147	66	1	12	....	12	....	15	36	2	5	7	7	17	16	....	....	[illegible]
July:																		
Admissions	5	....	2	....	....	....	....	....	....	....	1	....	....	....	1	....	....	[illegible]
Readmissions	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	[illegible]
Sick days	11	....	15	....	....	....	....	....	....	....	1	....	....	....	3	....	....	[illegible]
Treatments	57	62	3	10	....	8	....	20	82	3	8	9	....	25	11	....	3	[illegible]
August:																		
Admissions	3	....	....	....	....	....	....	1	....	....	1	....	....	....	....	....	2	[illegible]
Readmissions	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	....	
Sick days	10	....	....	....	....	....	....	9	....	....	19	....	....	....	....	....	10	[illegible]
Treatments	58	78	1	7	4	5	....	17	48	1	1	5	3	7	4	....	1	[illegible]
Total:																		
Admissions	10	....	2	....	....	....	....	1	1	....	2	....	1	....	3	....	2	[illegible]
Readmissions	....	....	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	1
Sick days	25	....	15	....	....	....	....	9	7	....	20	....	5	....	8	....	10	[illegible]
Treatments	262	206	5	29	4	5	....	52	166	6	14	21	10	47	31	....	4	[illegible]
CREW.																		
June:																		
Admissions	....	1	6	....	....	....	....	1	....	1	1	(1)	....	....	1	1	....	[illegible]
Readmissions	....	....	2	....	....	....	....	....	....	....	....	....	....	....	....	....	....	[illegible]
Sick days	....	4	45	....	....	....	....	2	....	2	20	8	....	....	2	7	....	[illegible]
Treatments	24	12	20	1	2	6	....	....	17	1	13	8	1	15	7	....	5	[illegible]
July:																		
Admissions	2	2	14	....	....	....	1	1	1	....	2	1	....	....	1	(1)	2	[illegible]
Readmissions	....	1	1	....	....	....	....	....	....	....	....	....	....	....	....	....	....	[illegible]
Sick days	21	26	18	....	....	....	13	5	1	....	57	2	....	....	42	31	5	[illegible]
Treatments	28	11	19	3	1	5	....	13	14	....	3	8	3	8	4	....	5	[illegible]
August:																		
Admissions	3	(1)	6	....	....	....	1	(1)	1	....	3	1	1	....	(1)	(1)	3	[illegible]
Readmissions	....	....	....	....	....	....	....	....	....	....	1	....	....	....	....	....	....	1
Sick days	14	22	42	....	....	....	34	1	8	....	41	6	14	....	26	25	13	[illegible]
Treatments	43	12	30	4	7	....	....	10	18	....	8	4	4	9	3	....	6	[illegible]
Total:																		
Admissions	5	3	26	....	....	....	2	2	2	1	6	2	3	....	2	1	5	[illegible]
Readmissions	....	1	3	....	....	....	....	....	....	....	1	....	....	....	....	....	....	5
Sick days	35	52	105	....	....	....	47	8	9	2	118	14	14	....	70	63	18	[illegible]
Treatments	95	35	69	8	10	11	....	23	49	1	24	20	8	32	14	....	16	[illegible]
Grand total:																		
Admissions	15	3	28	....	....	....	2	3	3	1	8	2	4	....	5	1	7	[illegible]
Readmissions	....	1	4	....	....	....	....	....	....	....	1	....	....	....	....	....	....	6
Sick days	60	52	120	....	....	....	47	17	16	2	138	14	19	....	78	63	28	654
Treatments	357	241	74	37	14	36	....	75	215	7	38	41	18	79	45	....	20	[illegible]

[1] Patients continued from before June 7 or from previous month.

Digestive disturbances.—Under this heading are included only three conditions—constipation, acute enteritis, and duodenitis, the latter giving rise to the 20 sick days for the crew in July. All other admissions and sick days were for acute enteritis. The bulk of treatments were for constipation, this being particularly true of the months of June and July. In August a series of unexplained cases of acute enteritis arose, more marked in the crew than among midshipmen, and during this month this disease furnished the majority. An examination of the records show that an abrupt rise in the number of treatments for constipation immediately follows the date of departure from each of the ports visited. This was

most evident following the departure from Annapolis, when, in 3 days, 70 treatments were given, or nearly half of the total of 142 treatments for this condition during June. It is a well-known fact that most people suffer from a sluggishness of the bowels in varying degree, at the beginning of a sea voyage, and it would appear that possibly an abundance of fruit (fresh, preserved, or canned), and coarse-fibered vegetables, served three times a day, starting the day before and continuing for two days following departure, might obviate this difficulty in most cases.

Skin diseases.—Throughout the trip ringworm furnished most of the treatments, although there were but two or three fresh cases developing on board. The persistence of this condition is partially accounted for by the neglect on the part of the midshipmen to make proper use of the abundant supply of fresh water. A special head was set aside for the use of these patients, and their clothing was sterilized regularly every three days and before going to the laundry. There was no ringworm among the crew. In the matter of providing opportunities for keeping clean, no effort was spared. As was mentioned before, salt showers, ample for the entire personnel, were provided; the junior officers' mess room was fitted with hand basins with running fresh water (a certain number being set aside for cleaning the teeth); midshipmen were allowed pails when desired; the washroom and showers were available for considerable periods four times a day, and there was no restriction placed upon the amount of fresh water each man used; further, the bulk of their clothing was washed in the ship's laundry, but in spite of all these exceptional advantages, it was noted that as a rule the crew were cleaner than the midshipmen, both in clothing and bodies. This state of uncleanliness steadily improved as the cruise progressed, indicating that it was a lack of adaptability to ship life rather than negligence or unwillingness on the part of the young men. Also the raw, penetrating weather encountered at the start had a deterring influence on the amount of bathing and the time spent in scrubbing clothes. It is believed that this condition of affairs could be readily and rapidly overcome by having the first classmen instruct the third classmen at each washing period for the first week or so, in the art of keeping clean on board ship. This process would be greatly aided were the first few weeks of the cruise spent in the subtropical waters. Except for three cases of boils, in August, seborrheic eczema furnished all the sick days noted under skin diseases. Impetigo contagiosa, acne, and warts are included under this heading.

Venereal diseases.—Of the three diseases thus classed only two cases of gonorrhea developed (one being readmitted with involvement of the epididymis), and both first showed symptoms soon after

leaving Antwerp. This may be considered as speaking well either for the character of the midshipmen, care in choice, or cleanliness of ports visited, possibly all three combined. The crew, however, were not so fortunate, as venereal diseases show a high rate. Here again the bulk of the primary admissions followed the visit to Antwerp. The midshipmen received instruction in sex hygiene and the dangers of venereal diseases, but for various reasons were not instructed in venereal prophylaxis. Many exposed themselves to infection and quite a few applied for prophylaxis, but not having had instruction in its use, allowed many valuable hours to slip by before appearing for treatment. It was evident that they had heard of venereal prophylaxis from some source, but had failed to realize the all-important point relative to time of administration after exposure; for example, one midshipman applied for the treatment three days after connection. It would appear that keeping them in partial ignorance by lack of proper teaching is an error, and that carefully worded lectures on the subject should be a part of the instruction given by the medical officer. Prophylaxis was entirely voluntary for the crew on account of the extended liberties, and was provided for all those who applied both in the form of kits to take with them, and treatment upon return to the ship.

Dental, ear, and eye affections.—The conditions observed under these groups were all of very minor importance, such as involvement of the Eustachian tube following tonsillitis or "colds," or impacted cerumen, foreign bodies in the eye, and unerupted wisdom teeth.

Tuberculosis.—Several midshipmen who lost weight and appeared below par were examined carefully, but no cases of tuberculosis were demonstrated in this group. Of the two cases admitted from among the crew one was of the distal end of the femur, the other an incipient condition in the lung.

Tonsillitis and colds.—These two conditions waxed and waned almost synchronously, and closely followed climatic conditions. The number of treatments steadily increased during the trip eastward, and culminated in an abrupt rise during the latter part of our stay in Antwerp. This can readily be explained by the raw, cold, damp weather encountered. During the passage to Vigo and the stay at that port the curve gradually falls with the advent of sunshine and cool, dry weather, but immediately after reaching Cadiz there was an abrupt rise and a continued high level during our stay in that port and Gibraltar. There are two possible explanations: At both these stops the country was dry and parched, and this, associated with high winds, kept the air filled with flying dust from the dirty streets a large part of the time. It must also be remembered that just before reaching Cadiz the first hot weather of the trip was encountered, and both midshipmen and crew abruptly discarded their overwarm

blankets and commenced sleeping on deck. Through inexperience and carelessness they thus exposed themselves unduly to the chill of the early morning hours and the dews of the night. From Funchal on the persistent high temperatures and slight variation between day and night, associated with increasing experience, probably accounts for the steady decline and ultimate disappearance of these troubles. The matter of experience is clearly demonstrated in the vastly higher percentage amongst midshipmen as compared with the crew. Or possibly it may indicate only a greater readiness on the part of the midshipmen to undergo treatment, which is the natural outcome of higher education and the resultant keener perception of bodily ailments.

Seasickness.—Only one case was admitted for seasickness and, curiously enough, it was one of the crew. In fact, it was observed that apparently more of the crew than of the midshipmen suffered actively. All were ready and willing to "stick it out" and continue duty after they had received a little encouragement. The rather unprecedented calmness of the weather undoubtedly influenced the results.

Miscellaneous.—In this group appear: Phimosis, infected wounds of minor degree, neuritis (sciatica), rheumatism, vermin (pediculi pubes), lymphangitis, a case of nonveneral bubo, foreign body in throat, and a case of bronchitis. The first condition mentioned gave rise to the only use made of the well-equipped operating room, which was reserved for clean cases.

Wounds.—All the wounds admitted were inconsequential, with the exception of one amongst the crew. This patient stepped into the rapidly revolving fan of one of the ventilating systems on the deck of the forecastle, the cowl of which had been knocked off but a moment previously.

Fractures.—As is seen by the table under discussion, the midshipmen fortunately escaped this type of injury. The members of the crew were nearly as fortunate, but it so happened that the one fracture sustained was of the os calcis, which laid up the patient for practically the entire trip. The injury was the outcome of jumping from the ship to the quay for the purpose of handling the lines in bringing the vessel to her moorings at Antwerp.

Heat affections.—Little trouble was experienced with the heat in the firerooms, and there was but one marked case of heat cramps and only three or four of mild heat exhaustion. The two admissions from among the midshipmen personnel were for thermic fever,[1] they having been overcome while firing the boilers during the run from Funchal to Hampton Roads, when the high temperature and humidity and light airs on the quarter combined to make conditions in these com-

[1] See the Bulletin, October, 1913, p. 579—Ed.

partments particularly unfavorable. Both young men suffered from typical symptoms of sunstroke, hot dry skin, cyanosis, and labored respiration. One showed a rectal temperature of 107.5° F., the other 107° F., the former remaining unconscious for only about 20 minutes, the latter for 4 hours. Here again the policy of having the initial stage of the cruise in the hotter climate would result in benefit. As part of their practical instruction in engineering the midshipmen are taken below and shown the process of running the engines and handling the boilers, and after about a month of observation and teaching they are put on watch in the engine and fire rooms, performing the actual work of machinists, oilers, water tenders, firemen, and coal passers. Such manual labor for green men is trying even under most favorable conditions, and when atmospheric conditions are such that temperatures rise to 138° F. or 150° F., and there is little interchange of air, it is not hard to imagine the possibility that some will break down under the unaccustomed strain. It would seem, therefore, far better to have them undergo the period of observation and instruction during the hottest part of the trip and not be called upon to perform the actual work until the cooler weather is reached upon the return trip.

This group also includes the burns encountered, all of which were of very mild degree.

TABLE B.—*Summary of effects of diseases and injuries.*

	Midshipmen.	Crew.
Period covered, in days, June 7 to Aug. 26, 1913	80	[illegible]
Average strength	225	[illegible]
Total number of sick days for disease	76	[illegible]
Total number of sick days for injuries	23	[illegible]
Total number of sick days	99	[illegible]
Average for those sick	4.3	[illegible]
Average number of days lost per man for total personnel of each group	0.44	1.[illegible]
Admissions for disease	16	[illegible]
Admissions and readmissions, disease	17	[illegible]
Ratio per 1,000 of strength	75.55	14[illegible]
Admissions for injuries	6	[illegible]
Admissions and readmissions, injuries	6	[illegible]
Ratio per 1,000 of strength	22.22	3[illegible]
Remaining on sick list June 7		[illegible]
Discharged to duty	23	[illegible]
Discharged to hospital		[illegible]
Remaining on sick list Aug. 26		[illegible]
Deaths		
Daily average of patients	1.23	[illegible]
Ratio per 1,000 of strength	5.5	1[illegible]

Discussion of Table B.—The comparison between the health of midshipmen and crew is not so unfavorable as it first appears, although the latter undoubtedly did not do as well as the former. The high average for the number of days each case was treated is readily accounted for by the fact that the two injuries, fracture of os calcis and wound of foot by electric blower, occurred early in the trip and were of such a nature as to cause them to remain on the sick list for

the balance of the cruise. This effect was further intensified by the presence amongst the crew of the cases of bone tuberculosis and nonvenereal bubo. These 4 cases gave rise to one-third of the 555 sick days, and the venereal diseases made up a considerable portion of the remainder.

If the time lost by sickness had been divided equally amongst the total number of each group (average number of days lost per man for total personnel of each group), it is found that each midshipman would have lost 10.5 hours and each of the crew would have lost 37.6 hours. In other words, if all individuals had been sick at the same time, the entire number of midshipmen would have been out of commission 10.5 hours and the entire crew for 1 day and 13.6 hours. Looking at this from still a different standpoint, it is seen that each day during the entire trip 1.23 midshipmen and 6.93 men were not rendering return to the Government. When compared with the returns from other ships and for the entire service, these losses are well below the average.

The fact that there were no injuries of any consequence amongst the midshipmen is rather remarkable when it is considered that they were entirely unfamiliar with conditions on board ship, and especially so of the complicated mechanisms as set up in confined spaces. When it is considered that these midshipmen with a month or so of training and without even a nucleus of experienced men, as is always true under usual service conditions, went through a target practice conducted under the established rules for battleships, handled the guns and ammunition themselves, including the 13-inch turrets, and met with not the slightest mishap, the absence of injuries, not to mention deaths, seems to be all the more wonderful.

TECHNIQUE OF NEOSALVARSAN ADMINISTRATION AND A BRIEF OUTLINE OF THE TREATMENT FOR SYPHILIS USED AT THE UNITED STATES NAVAL HOSPITAL, NORFOLK, VA.

By W. CHAMBERS, passed assistant surgeon, United States Navy.

Since the beginning of the year 1913 over 1,000 intravenous injections of neosalvarsan have been given at the United States naval hospital, Norfolk, Va.

The technique used at present is as follows: Distilled water is collected early the day before the operation and is repeatedly distilled until the following morning, when it is collected in a hard-glass flask and sufficient c. p. sodium chloride is added to make a 0.4 per cent solution. The saline solution is then sterilized in an autoclave with sufficient plain distilled water to make up for the water lost from the solution during the sterilization.

The temperature of the solution is then reduced to about 24° C., and the contents of one vial of neosalvarsan, in doses ranging from 0.15 to 0.9 gram is dissolved in 20 cubic centimeters of the saline solution, which is then filtered and injected into a vein with a 20-cubic-centimeter record syringe.

Tincture of iodine is used to sterilize the arm and the needle is inserted beneath the skin parallel to the selected vein for a distance of three-fourths of an inch before it enters the vein. This method prevents the leakage of blood after the needle is withdrawn and probably lessens the danger of infection through the skin puncture. Another advantage of this method is that it gives a better hold and does not allow the vein to slip above or below the point of the needle.

Five hours after the injection, if the patient has a normal temperature and no signs of reaction, he is allowed to have his regular diet and get out of bed; he is cautioned against unusual exertion.

The careful preparation of the water has removed the unpleasant after effects of neosalvarsan treatment. The so-called Herxheimer reaction occurred seven times in 1,000 cases; all in early secondary cases after the initial injection. The reactions were characterized by moderate fever, intensification of the eruption, and headache.

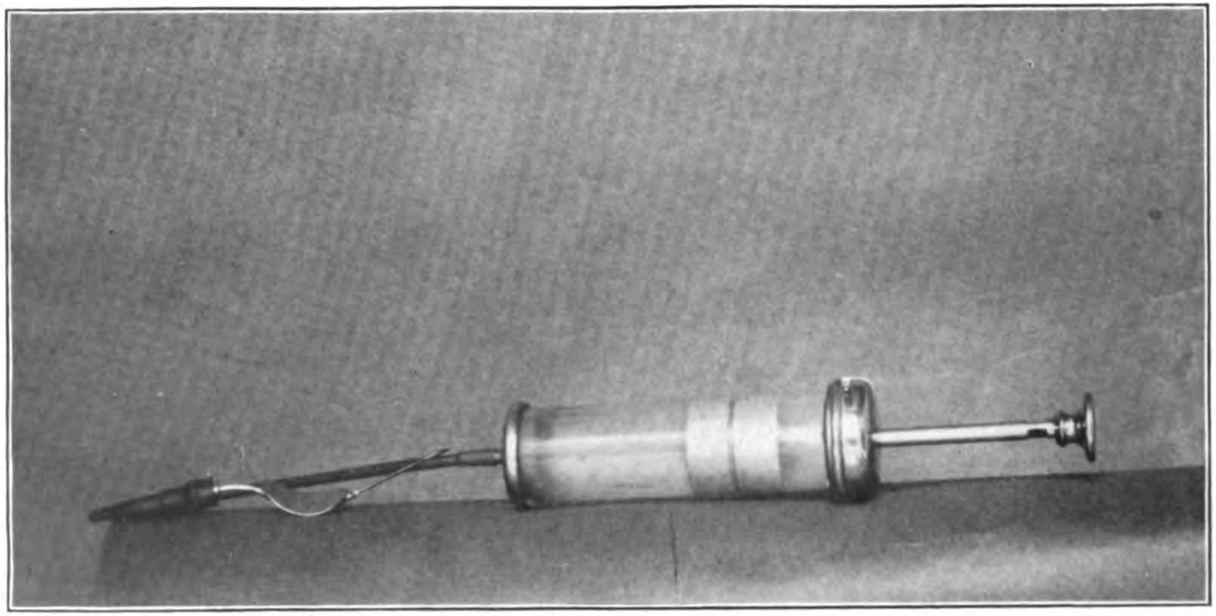
A reaction accompanied by urticarial eruption, fever, nausea, vomiting, and diarrhea is probably due to faulty technique.

The routine treatment for syphilis used at this hospital consists of daily inunctions of mercury ointment with an intramuscular injection of mercury succinimide every week. The average dose has been about four-fifths grain.

If signs of mercurialism appear, the use of the drug is discontinued and the patient is given hot cabinet baths three times a week until the symptoms disappear, when the mercury is resumed.

If no contraindications are found, neosalvarsan is given every seven days until a negative provocative Wassermann reaction is obtained. The usual dose is about 0.75 gram of neosalvarsan, with 0.9 gram in urgent cases.

A negative provocative Wassermann is usually obtained after about 9 injections, but occasionally 12 or more are required. When a patient is discharged to duty a note is made in his health record recommending continuous mercury treatment and another provocative Wassermann at the end of a year to determine the advisability of further treatment.



APPARATUS FOR INJECTION OF NEOSALVARSAN.

SOME NOTES ON THE DISPOSAL OF WASTES.

By A. Farenholt, surgeon, United States Navy.

The question of the disposal of wastes, incidental to the collection of numbers of men, and the preparation of their food, is one of the most important confronting those charged with the responsibility of the sanitary affairs of these men. At sea the question is, of course, handled with far more ease than ashore; suffice it to say that those portions of wastes which it is deemed inadvisable to throw overboard, chiefly galley refuse, boxes, and clothing, which by floating might permit tracking by the enemy, are burned either in the (coal) steaming furnaces or in especially constructed incinerators.

On shore the problem is a more difficult and important one, the proper solution of which depends upon a careful consideration of:

1. Military situation.
2. Character of the country.
3. Materials available.
4. The length of stay.

Should camp be made where access to city sewers is possible, the question of the disposal of human excreta is at once solved. Should the force be supplied with any of the several types of excreta and garbage incinerators now on the market, the problem is reduced to one of location, erection, and operation. Without these, as is usually the case, the medical officer must improvise.

Human excreta.—Latrines should never be constructed over rivers, running water, or harbors, except after careful consideration of water contamination and the soiling of banks or beach. After years of experimentation the Army to-day relies chiefly, in semipermanent camps, upon the "latrine pit system." The weak points in this method are:

1. Danger from flies.
2. Caving in of sides in sandy soil.
3. Flooding of pits by rising water or rain.

Pits should be from 4 to 10 feet deep, depending on the probable length of stay. Seven feet gives good results. They should be 2 feet wide and from 8 to 20 feet long. In (a) temporary camps, (b) where no flies are present, and (c) where great care is taken, the single rail seat (open latrine) may be employed. Such pits are readily burned out and with care, easily kept in order. The fly question, especially in warm weather, often absolutely prohibits their adoption. Latrine boxes are usually preferable. They should be made in the following dimensions: Length 8 feet, height 16 inches, width at bottom 30 inches, top 18 inches. The box making a tight joint with the ground and the earth heaped up around it. The fly must be excluded. The dimensions given are for a latrine of 4

seats, and this makes an excellent unit. Seven-eighth-inch material, tongued and grooved, supported by 2 by 4's gives good results.

Pits should be burned out daily, preferably about 9 a. m. if by crude oil alone, taking 3 gallons for the above model, or, 1 gallon if used with hay or straw. Quick lime or chloride of lime should be sprinkled over pit three times each day. The earth accumulated from digging the pit should be piled up behind the latrine and the discharges covered after the lime is used. Whitewash helps to keep away flies, conduces to neatness, and should be used on boxes and on the shelter house which is usually erected over pit. Brush or canvas screens may be employed. When pits are closed to within 1 foot of the top they should be completely filled in, the site marked, and a new pit dug. Latrines should be under the care of a detailed guard, who may be taught and held responsible for conditions. Guards should be so detailed permanently and not frequently changed. Urinals should be made at one end of the latrine pit, metal troughs are very satisfactory if obtainable, but two boards nailed at right angles and covered with tar paper will suffice. Night urinals must be provided about a camp. These may be oil cans, buckets, or pits filled with broken rock. Tar-paper funnels, cornucopias, may be rigged to lead into cans, buckets, or post holes. In encampments intended to last from a portion of a day to a week, straddle trenches, spade width, 12 to 20 inches deep, may be dug.

Disposal of kitchen refuse, garbage, and hospital-tent waste.—Straub, United States Army, says: "The older method of burying garbage (kitchen pits) is not to be recommended, even for the most temporary camp, if the ground is to be reoccupied within a short period of time, and pits become the breeding places of innumerable flies." In camps situated near cities the opportunity and temptation will be offered to dispose of garbage by contracting to have it hauled away by civilians. This is almost always a false step in military economy, usually resulting in one or all of the following ills:

1. Irregular collections.
2. Spilling and general sloppiness.
3. Greater danger from fly nuisance.
4. Transfer of the evil features but a short distance.
5. Unpleasant odors and sights.

The garbage can should be banished and the incinerator installed. Many types may be made. That selected should depend for its maximum efficiency upon:

1. Length of probable duration of camp.
2. Character of soil.
3. Materials at hand.
4. Advisability of purchasing special materials and fuel.

In a soil containing stiff clay (adobe) the barrel type (beehive or volcano) gives excellent results and may be used as follows: Four boxes, having end areas of about 6 by 6 inches, are arranged upon the ground at right angles to each other so that when a barrel is placed on top of them each box will project nearly its entire length away from the center line of the barrel. Clay (sods may be used to reenforce earth having little stiffness) is banked up around the boxes and barrel, a fire started inside and the woodwork thus burned away, leaving a baked clay mold having four square openings at the bottom for necessary draft. Cans dumped in, covering the bottom a foot deep, will form an excellent substitute for grate bars. They must be removed every day or two. The fire is built above the cans and upon this the garbage is thrown. Two barrels may be employed to give greater draft. Instead of the four boxes used to form draft holes the following may be substituted: Two trenches about a foot wide are dug at right angles, 1 foot deep at point of intersection and tapering up to the surface 4 feet away; the barrel is placed over the crossing, banked up with clay, and burnt out as before. Liquids may be poured into these trenches and a small portion into the fire above. This type of crematory will, if 8 feet high and 4 feet inside diameter, take care of the kitchen waste of 2,000 men. The ordinary barrel model will be one-third as efficient.

A cistern-like hole 3 by 6 feet deep, filled with broken rock, may be used with advantage under almost any type of incinerator to dispose of the liquid parts of the wastes. Instead of trenches this may be connected with the outside by inclined iron or terra-cotta pipe lengths.

Where old oil or gasoline tanks are available the heads may be cut out and the cylinder used. They burn out, however, in a few weeks. Old grate bars set in brickwork are particularly useful. Wrought iron bends and becomes useless in a short time. Stovepipe lengths may be utilized to improve draft.

A more pretentious affair may be easily improvised by using brick and mortar when available. Fire bricks are superior to ordinary building bricks, and fire clay to ordinary mortar or cement, neither of which will withstand fire for any length of time. Common bank clay may be used if no fire clay is available. Lime made from incinerating sea shells has greater binding qualities than the commercial article.

The United States Army Field Service Regulations provide for the following incinerator for the disposal of kitchen refuse; it is particularly useful in sandy soil: "A pit is dug about 5 feet long, 2½ feet wide, 6 inches deep at one end and 12 inches at the other; the excavated earth is banked around the pit, and the latter is then filled with stones, on which a fire (can be used for cooking) is built; when

the stones have become heated liquid refuse is poured into the pit (shallow end), where it gradually evaporates; solid matter is burned on the fire." Where rock is not obtainable, fire bricks serve very well.

Maj. Geddings, United States Army, has successfully used the following: "An excavation in the form of an inverted turtle back was made, 5 feet long, 3½ feet wide, and 18 inches deep at the center. This was lined with fire brick, 110 laid flat, and constituted the above-mentioned incinerator. In some of the companies a coping 10 or 12 inches high was placed along the sides, thus increasing the draft and conserving fuel. As a refinement, a space about 2 feet wide was laid in cobbles all around the pit. Cordwood 4 feet long was used as fuel, and where intelligently managed all refuse was burned in them. No kitchen waste was allowed to be taken from the camp, and the use of the incinerator was enforced by allowing no garbage cans at the kitchens."

The Arnold crematory is practically the model described above as mentioned in Army Field Service Regulations. It may be made considerably deeper, i. e., 36 inches at one end and 48 at the other. A rock wall built up 1 foot to 18 inches around the three sides of the fire pit, something like a horsehoe, increases its value. A thin layer of mud or cement covering the surface of most of the rock increases its effectiveness. A grease trap into which all liquids are poured will benefit any type of incinerator and prevent clogging it.

About one-sixth of a cord of wood per day will care for the destruction of the garbage of 100 men. Liquid slops are evaporated by being slowly poured over the hot stones, preferably along the sides. "Careful experimentations showed that a skilled attendant could destroy 100 gallons of liquid and 23 cubic feet of solid matter in about 12 hours by using one-sixteenth of a cord of wood." (Straub.)

"The new Army field range may be set over this rock pit high enough to make a good fire box and mud banked up to the sides of the range." (Decker.)

An iron spider may be placed over the fire, its 4 legs resting on pit rocks. It helps to dry out wet garbage, thus aiding in its incineration and also forms a rest for wash boilers, kettles, etc., thus utilizing the heat generated. The rock pit incinerator uses more fuel than the barrel type but is more satisfactory for the disposal of liquids. This form also permits its heat to be more readily utilized by means of a spider and is more easily made in the majority of localities than the barrel type.

In improvising and managing an incinerator the following facts may advantageously be remembered:

Unless the soil is very stiff a rock pit below any type of incinerator will greatly aid disposal of liquid refuse.

Strain well all refuse, a piece of netting or a bucket with holes in the bottom may be used. Burlap does not make a good strainer.

Teach cook to waste little.

In incinerators using grate bars have openings above them through which to clean and build fires.

Two sets or tiers of grate bars help in starting new fires and in drying out refuse.

A grate area of 9 square feet will suffice for the disposal of garbage of 500 men.

Be careful about having hot thick fires before garbage is dumped in. Do not smother.

Have stack 10 to 12 feet if possible.

Have blanks to fit all doors and openings to aid draft.

The best draft is obtained by a straight perpendicular lead; turns diminish it.

Have one man detailed and instructed as in permanent charge.

Burn in incinerator all refuse from wards, bandages, dressings, post-mortem material, sweepings, etc.

Proper and complete incineration of garbage does not result in an offensive odor.

Human excreta can not be burned in an improvised incinerator with success, chiefly on account of the very unpleasant odor resulting.

THE MEDICAL DEPARTMENT ON EXPEDITIONARY DUTY.[1]

Suggestions based on observations made during the last Nicaraguan Campaign.

By R. E. Hoyt, surgeon, United Stases Navy.

So little has been written on the subject of the organization and equipment of the Medical Department of the Navy for expeditionary duty, and so meager are the instructions for medical officers considering the frequency with which expeditions have been occuring of late, that it seems advisable to suggest some definite organization of personnel and material, the plan outlined being the result of observations made during two of the recent marine expeditions, but chiefly during the last Nicaraguan disturbance.

Comparatively little attention is given and practically no preparation made for this line of duty by a medical officer until actual orders for it arrive, and as these orders usually require immediate obedience, no time is afforded for procuring the proper personal outfit or for rendering himself familiar with the duties of his new assignment.

A practical course of instruction in advance base and expeditionary work, as affecting the duties of medical officers, given to

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[1] Abstracted from an official report to the Bureau of Medicine and Surgery.

entering officers at the Naval Medical School would be of great value. All officers would then be prepared for this duty. The course should include instruction in the usual shore formations of the combatant forces, such as brigade, regimental, battalion, and company, and with the hospital organization accompanying these forces. They should be made familiar with the rules governing the selection of camp sites and the part played by the medical officer in their selection: instruction should be given in the most modern methods of camp sanitation, and this instruction should be as practical as possible; drills in tent pitching, erection of field hospitals, equipment of field dressing stations, wards, dispensary and operating tents, should be given with frequency sufficient to render the student familiar with the entire subject. The theoretical knowledge on these points is presupposed. It is training in the practical application of this knowledge that is so urgently needed in preparation for field duty. The actual installation, for instance, of a Forbes's sterilizer or the setting up and working of a Maignen filter will give far better results than theoretical study about them. In the same manner detailed practical instruction in the disposal of camp refuse and excreta—just how and where to erect latrines; dimensions of trenches; number of seats to a company; proper methods of policing them; methods employed in their disinfection; use of incinerators; how to erect them, and methods of employment; ways and means for protection of foods and stores from contamination by insects—all of these points and more may, with great advantage be learned beforehand. They will prove of great value to the medical officer on his first expeditionary duty when many such points are referred to him for solution. This previously acquired knowledge will not only save the officer himself from many embarrassing situations, but will gain for him the confidence of his commanding officer, something by no means easy for one who is ignorant or untrained in this particular branch of duty to obtain. No better time for becoming familiar with this subject can be found than during the course of instruction at the Naval Medical School.

It is to be regretted that medical officers detailed for expeditionary duty have no appropriate uniform authorized by the department. On the first detail for this service, usually under rush orders, the medical officer has nothing but the regulation blue or white service uniforms, both utterly inappropriate. The usual result after a few days' service is a combination of bought or borrowed marine officer's and private's uniform, without much regard to fit or appearance.

A field uniform authorized by the department should consist of a campaign hat similar to that worn by marine officers, blouse of same material as marine officer's, only made in all respects similar to Navy white blouse, except to have bronze instead of gold buttons; riding

trousers of the same material; puttees of leather or felt, or both, and tan shoes. In addition to these articles the marine flannel shirt and long khaki trousers should be allowed when similar uniform is being worn by the field officers. It would be advisable to supplement this field outfit with the inclusion of at least one blue and several white service uniforms for wear on occasions when the field uniform would be inappropriate. The avoidance of excess weight and bulk of personal baggage carried on these expeditions is most important, for owing to rough and constant handling and exposure to all kinds of weather there is always danger of injury, loss, or destruction. As the use of other than the uniforms above mentioned is practically never required, it is not only unnecessary but extremely unwise to include all the uniforms used on shipboard. All dress uniforms, civilian clothes, capes, and overcoats should therefore be left behind. One strong steamer trunk will usually contain all effects necessary. Toilet and additional articles could be added just before leaving, according to personal taste and space available for packing. Other articles of equipment, such as haversacks, ponchos, belts, canteen, side arms, shelter tents, cots, and mess gear will be furnished by the quartermaster of the expedition when required.

Members of the Hospital Corps should also receive some preliminary instruction in duties peculiar to this line of work before actually taking the field, and the suggestions made with regard to the medical officers will apply equally well to the enlisted force. Practical drills in the common Infantry formations and in tent pitching and field hospital equipment should supplement the instruction in first aid and litter bearing. It is needless to say that proficiency in the two latter subjects should be of the highest, and for this reason it is recommended that only hospital stewards and hospital apprentices, first class, be assigned to this duty. The training of the newly enlisted hospital apprentices accompanying the last Nicaraguan expedition had not been sufficient to render them useful professionally, and as a result practically all the nursing proper fell to the two stewards and three first-class apprentices, thereby unduly increasing their work and often necessitating the detailing of experienced privates as their assistants to replace the newly appointed apprentices. The chief usefulness of the latter consisted in policing the field hospital and as bearers of Hospital Corps pouches on the march. There was practically no time after the expedition started to instruct them in the proper duties of their rating. It is on such duty as this that the true value of men carefully trained in first aid is appreciated. The knowledge that wounds will be properly dressed and that patients will receive intelligent treatment by these men not only relieves the medical officer himself of great anxiety and responsibility, but inspires the entire fighting force with confidence otherwise unattainable.

The objections found to the commissioned officers' present uniforms on campaign duty will apply with equal force to those worn by members of the Hospital Corps. I have personally observed a first-class apprentice, attached to a company and on the march, deliberately lie down in the road and smear his white uniform with mud in order to render himself less conspicuous and so be able to accompany the troops.[1] As in the case of officers, many of these men obtain khaki outfits by borrowing or buying from the marines, but as this is often not to be relied upon it would be advisable to authorize a campaign outfit for the Hospital Corps in all respects similar to that of a private or noncommissioned officer of marines, as the case may be, with the addition of the proper corps device on the sleeve.

Officers and men having therefore received some preliminary training and equipment for this duty, it is now necessary to consider some practical and definite organization for this medical personnel. As there are no definite instructions issued by the department on this point, as a rule the Army Hospital Corps formation with many necessary modifications is adopted. During the last Nicaraguan campaign the following organization was employed with good results. Four medical officers, 2 stewards, 3 hospital apprentices, first class, and 8 hospital apprentices, reported for duty in connection with a regiment of 750 men, on board the *Prairie*. In a letter to the regimental surgeon from the bureau, received the day before embarking, it was stated that 4 officers and 28 experienced Hospital Corps men had been detailed to report for this duty. As these men were presumably scattered among the various yards or hospitals along the coast, the fact that only 13 arrived in time to join the expedition emphasizes the importance of some practical preliminary organization.

The regiment was divided into a regimental staff; 2 battalion staffs and 2 battalions, one of 4 and one of 3 companies, each of

[1] In this connection the following extract from the annual sanitary report of the U. S. S. *Michigan*, 1912, submitted by Surg. C. G. Smith, United States Navy, is of interest: "The clothing is of good quality and suitable, but it is recommended that some uniform be provided for the landing force. The writer was with the Fourth Division last summer during the political trouble in Cuba when it was expected that the battalions from the ships would land. The uniform in which the men would have had to go in action, had occasion demanded, would have been very conspicuous and offered excellent targets for the enemy. The commanding officer recognized this and besought me to find something that would dye the white uniforms some inconspicuous color. This seemed like a large order, but after experimenting I hit upon sulphate of iron, of which the sick bay had about 50 pounds, intended to be used as a disinfectant. I made a 2 per cent solution in fresh water and tried out a piece of white material. It was dyed a greenish blue, and I thought it would do, but when I rinsed the cloth in an alkali solution to neutralize the acid salt, much to my surprise I found that it turned into a perfect khaki color. The commanding officer was delighted and ordered every man in the battalion to dye one suit of working whites. This was easily accomplished by supplying every four men with two buckets, one containing a 4 per cent solution of ferrous sulphate and the other with 2 per cent of common lye. They set to work, and in a few hours the battalion was equipped with a khaki uniform which would have no doubt reduced the casualties incident to gun fire had we landed and got into action. This is offered as a suggestion to other medical officers should they be confronted by a similar emergency. I may add that the dye remains fast to sun and rain."

The Bureau has on several occasions recommended the substitution of khaki for white uniforms of officers and men.—Ed.

about 400 men. Before disembarking at Corinto the following order was proposed by the regimental surgeon and approved by the commanding officer:

ORDER.

First. If the regiment remains intact on going into camp, the medical department will organize a field hospital as follows:

Regimental surgeon....................in charge.
Senior assistant surgeon...............executive surgeon.
Two junior medical officers............ward medical officers.
Senior hospital steward.................in charge records and dispensary.
Junior hospital steward.................in charge stores.
Hospital apprentices...................detailed on landing.

The medical officer of the day will hold morning sick call.

Second. In case the battalions work separately and encamp in different locations, the organization will be as follows:

(*a*) Regimental field hospital personnel to accompany regimental staff and equip hospital at headquarters.

Personnel to consist of:

Regimental surgeon.
Senior assistant surgeon.
Two hospital stewards.
Three hospital apprentices.

In connection with the regimental hospital, a medical supply depot will be organized where stores for the field forces may be obtained as needed by the battalion medical officers.

(*b*) A hospital corps unit, composed as follows, will accompany each battalion:

One junior medical officer.
One hospital apprentice, first class.
One hospital apprentice.
Two privates.

Battalion medical officers will draw upon the field medical supply depot for necessary equipment, signing receipts for all supplies received.

They will hold sick call for their respective battalions, keeping careful record of the sick. Admissions to the sick list will be made on the usual forms.

One morning report of sick will be submitted to the battalion commander, and, if practicable, one to the regimental commander through the regimental surgeon.

Cases requiring admission to the sick list but not prolonged hospital treatment will be treated at "battalion infirmaries." Records of cases so treated will be kept on detached sheets from health record books; on patient's discharge to duty, these sheets will be forwarded to the regimental hospital. In case of a patient's transfer to the regimental hospital, procedures similar to those adopted at regular naval hospitals will be carried out.

Third. Battalion medical officers will act as sanitary officers of their respective battalions, paying particular attention to the sanitation of camp site, water supply, company kitchens, latrines, proper disposal of refuse, and protection of food from insects. Sanitary conditions will be reported from time to time to the regimental surgeon.

Fourth. Battalion surgeons will see that there are sufficient first-aid packets and identification tags on hand to supply all men and officers of their battalion in case of action. Instruction in the use of these articles will be given by the medical officers.

(Signed) —— —— ——,
Regimental surgeon.

Approved:

—— ——,
Colonel, commanding.

Encamped in regimental or brigade formation, the problem of medical corps organization is comparatively simple. The regimental surgeon acts as chief sanitary officer and as direct advisor to the commanding officer on all subjects relating to hygiene and sanitation. He will have charge of the regimental field hospital. The battalion surgeons perform duties similar to those of junior medical officers at a naval hospital. They hold sick call for their respective battalions at the regimental hospital; take charge of their own sick and their records; submit sick reports to their battalion commanders and to the regimental surgeon; act as sanitary officers of their own battalions; instruct the men in first aid, and alternate as medical officers of the day for the entire camp. The details of hospital corps men will also be similar to those at naval hospitals, one steward having charge of all official records, etc., one in charge of stores and dispensary, one in charge of operating tent, and apprentices detailed according to circumstances. Each man should have certain definite routine duties to perform and regular liberty periods granted, similar to those allowed to the enlisted men of the combatant force. In fact, the routine should approach as nearly as possible that observed at naval hospitals.

With the battalions of the regiment working separately, and encamped at considerable distances from each other, the problem becomes more complicated. The Hospital Corps must become divided and a battalion Hospital Corps unit accompany each division, the unit consisting of one medical officer, one hospital steward and as many hospital apprentices, first class, as there are companies in the detachment. The medical officer of this unit will establish a battalion infirmary, the organization of which will be similar to a regimental hospital, only on a smaller scale. This is the plan which it was necessary to adopt in Nicaragua. The regiment was from the beginning divided into two forces, which acted separately. One battalion of three companies encamped near the town of Leon. The other, consisting of four companies, with the regimental staff proceeded farther inland and encamped at Managua, about [illegible] miles by rail from Leon. One medical officer and four hospital corpsmen made up the battalion Hospital Corps unit for the former battalion. In addition to a similar unit accompanying the larger division, the regimental surgeon, one junior medical officer, two stewards, and three apprentices went with the regimental staff and established a regimental hospital and storehouse at the larger camp. Later a sailor battalion reenforced the camp at Leon and accompanying this was another Hospital Corps unit from the ships. Likewise at Managua four companies of sailors encamped with the marine battalion, but as this force was without a Hospital Corps unit the

unior medical officer attached to the field hospital force, and two hospital corpsmen were detailed for this duty.

The Hospital Corps organization in the field and on the march should be next considered. A clear understanding of this may perhaps be obtained by describing the formation and movements of the personnel before, during, and after the engagement between our forces and the rebels at Coyotepe Hill, Nicaragua, on October 3, 1912.

On October 2 orders were received by the regimental surgeon to prepare his division for an expedition against the rebel forces at Masaya, a small town about 20 miles from Managua. The attacking force was to consist of about 5 companies of 100 men each and 1 company of Field Artillery. The arrangement of the medical personnel was as follows:

One medical officer with a Hospital Corps unit was left at camp in charge of regimental hospital. Regimental surgeon, hospital steward, and two first-class apprentices accompanied the regimental staff to act as the personnel of the field hospital. A battalion medical officer and Hospital Corps unit proceeded with the battalion to establish dressing stations and administer first aid. Two privates from each company were detailed as stretcher bearers and took their orders from the battalion medical officer. Every officer and man in the command was supplied with a first-aid packet. All members of the Hospital Corps were supplied with completely equipped Hospital Corps pouches and additional first-aid packets. The battalion left Managua by train that afternoon and arrived at Campo Sano, about 4 miles from the rebel position, at about 3 o'clock. Demands to the rebels to surrender being refused, our forces under cover of darkness detrained and proceeded to Mindiri, a small village situated to the right of the enemy's position on Baranca Hill. During the night the Artillery was placed in position and the Infantry troops moved to a sheltered gully between the Baranca and the position of our guns. The battalion Hospital Corps unit accompanied this force. The field hospital was located in a large church in Mindiri village to the left of the enemy's line of fire and within easy communication of both the Infantry and Artillery positions. A corner of the church was prepared for an operating and dressing station and equipped with all articles necessary for such work. Cots were placed in another part of the building for use of the wounded. A company cook left behind in charge of a messing outfit was employed as an assistant to the hospital force for preparing food and for the heating of water for sterilizing purposes. The regimental surgeon, one hospital steward, two apprentices, several privates, and natives comprised the personnel of the station. All medical supplies and equipment were transported from the train to the church in oxcarts, which were sup-

plied by the native Federal officers. Several of these carts were retained at the field hospital for the purpose of transporting the wounded from the Artillery position to the hospital, or in case it became necessary to carry our equipment to some other point. After completing the preparation of the field hospital one apprentice was detailed for duty with the Artillery division. Briefly stated, therefore, the organization of the medical department consisted of: First, regimental hospital at Managua; second, line of communication by rail between Managua and Mindiri and Masaya; third, field hospital and dressing station at Mindiri; fourth, dressing stations at sheltered locations in rear of Artillery and Infantry lines; fifth, facilities for individual first-aid treatment on the firing line.

Early in the morning on October 3 our artillery began shelling the two hills in front of Masaya, occupied by the rebel forces; this firing continued at intervals during the day, but brought no response from the enemy. At nightfall it was decided to move the infantry around to a position on the left flank of the rebels, occupying Coyotepe Hill, and at daylight on the following morning to take the hill by charging their position. The artillery was to remain on the right flank and to continue firing at the Baranca at intervals during the night. Under this arrangement the larger division of our force would be several miles from Mindiri, where the field hospital was located, and as far to the left of the railroad as their present position was to the right of it. It was decided, therefore, to move the hospital back to the railroad and equip as many box cars as needed for a field hospital. With this arrangement it would be possible to move the train nearer the hills as the infantry made its charge and thereby be within easy reach of the wounded. Accordingly, under cover of darkness, all medical equipment was placed on oxcarts and hauled back to the railroad. One box car was fitted out as an operating and dressing room and two were equipped with cots. The battalion Hospital Corps unit accompanied the infantry to its new position.

The next morning at 6 o'clock the charge against Coyotepe Hill was begun, and for 20 minutes the firing was fierce and continuous; after 30 minutes' firing, our troops had captured the hill. While this infantry attack was in progress, several shrapnel fired at the train from a field gun situated on the hill necessitated pulling the train back out of range. This gun being quickly put out of commission by a shot from our own artillery, the train was then run down to the foot of the hills, where the dead and wounded of both sides were brought aboard. Four of our men were killed and 8 or 10 wounded during this charge. All had received first-aid treatment on the line and, after arrival at the train field hospital, their wounds were examined, redressed, and splints applied where needed. All the dead and

wounded having been placed aboard, the train was dispatched to Managua and the patients were transferred to the regimental hospital.

A similar organization of the medical department was adopted on practically all expeditions which our forces made in Nicaragua and the results obtained were very satisfactory.

Taking a regiment of two battalions as a basis, therefore, the medical personnel accompanying it should be as follows:

I. In connection with the regimental staff:

(*a*) Regimental surgeon.
(*b*) Assistant surgeon.
(*c*) Two hospital stewards.
(*d*) Two hospital apprentices, first class.

II. In connection with battalions, for each battalion:

(*a*) One battalion surgeon.
(*b*) One hospital steward.
(*c*) As many hospital apprentices, first class, as there are companies in the battalion.
(*d*) Two privates from each company as stretcher bearers.

Having, therefore, decided upon some definite working organization of the personnel, it next becomes necessary to consider the most practical equipment to take on these expeditions.

The assemblage of all articles necessary into a brigade or regimental field-hospital unit, such as was furnished during the Nicaraguan expedition, while possessing certain advantages, is open to the objection that owing to frequent division of the forces into battalions which often work separately at different locations this equipment often has to be divided into smaller units in order that each camp shall be supplied with hospital facilities. This results in much confusion, and each division is very incompletely equipped. A more practical arrangement would therefore be the division of the equipment into battalion medical units, using, for instance, a battalion of four companies, with a total of from four to five hundred men, as a working basis. A battalion medical unit would then be furnished to each battalion accompanying the expedition. If the forces encamped in regimental or brigade formation, the medical units, being consolidated, would equip a regimental field hospital. Under these circumstances, as each unit contains identical equipment, it would be unnecessary to unpack them all, and the intact units could be kept for use with battalions which might at a later time work separately. This equipment could be carefully prepared at the supply depots and a sufficient number of the units be kept in readiness for instant use at the marine storehouses at Philadelphia and Puget Sound. It might also be advisable to have one unit on each of the division flagships of the fleets.

Before considering in detail the supplies necessary in this equipment a few observations as regards preparation and packing may not be out of place.

First, the boxes in which these supplies are packed should be as nearly uniform in size as possible to facilitate rapid handling. As they are subjected to frequent and rough handling on being transferred from shore to ship and oftentimes from ship to lighters or small boats to shore again, the construction of the boxes should be sufficiently strong to withstand this unusual treatment as well as sufficiently light to render possible the rapid moving by hand. Screws instead of nails should be used in making these boxes and fastening their covers.

On the last Nicaraguan expedition about 150 boxes containing medical equipment were subjected to rough handling no less than ten times before reaching their final destination. Many of these boxes were very heavy and were not properly constructed or fastened with sufficient security to withstand this treatment. As a result many were found badly damaged. It is important, furthermore, that all boxes containing medical supplies be marked in some conspicuous manner in order that they may be readily found when mixed with large numbers of other boxes containing expeditionary equipment. As a rule, all the stores, including medical, are handled by the men under direction of the regimental quartermaster, and during the numerous transfers that take place all boxes and crates become hopelessly mixed, and their sorting and rearrangement must be delayed till their final destination is reached. It would be well to have all property, such as boxes, crates, tent poles, etc., belonging to the medical department, painted some distinctive color before being issued in order that they could then be easily recognized and much confusion avoided. Painting the entire box rather than marking with a red cross, as is sometimes done, is considered preferable. In the latter case the crosses are often obscured by other boxes and can not be detected. If painted in their entirety, they can be picked out with ease if only a small portion is visible.

Taking, as before, a battalion of four or five hundred men as the unit, and the average length of time to be away on an expedition as two to three months, it next becomes necessary to consider the preparation of a medical and surgical equipment which shall contain only essential articles and be as compact and light as possible. This equipment can be divided into, first, that needed en route; second, in camp; third, in the field.

While on transports en route to the objective point, the sick will receive medical attention at the sick bay on board ship. After landing and while on the march or traveling by rail there should be some

preparation for the care of the sick or wounded. The first box of this battalion medical unit should therefore contain six fully equipped large Hospital Corps pouches. Before disembarking, this box should be opened and the pouches distributed to the members of the Hospital Corps, each man being held responsible for the pouch he carries. The second box, or rather crate, should contain six Army stretchers, which, before landing, should be opened and the stretchers given in charge of the stretcher bearers previously detailed from each company. The next box should contain a supply of first-aid packets, one packet to be given to each man before leaving the ship. These three boxes, therefore, would contain all necessary medical equipment for the battalion on the march.

The equipment necessary in camp should next be considered. Under ordinary conditions, with the battalion encamped for an indefinite period, five hospital tents and one wall tent would be sufficient for the formation of a field hospital. In case more are needed they can usually be obtained from the quartermaster. One tent would be fitted up as a dispensary; one as an operating tent; two pitched with ends adjoining, and perhaps an extra fly in front, will be used for a ward tent; one for stores and hospital apprentices' quarters and the wall tent for an office and stewards' quarters. Boxes containing these tents, with the tent flies and stakes, and crates containing the poles will be the basis of this equipment. As it may be necessary to clear ground for these tents, dig holes for the poles, drive stakes, etc., a box containing implements for this work must be included. Furthermore, as this work may have to be done during the night, it will be necessary to have a box containing lighting equipment, such as lanterns, candles, oil, etc., ready for immediate use.

The equipment necessary for each of these tents should be packed in separate boxes and these boxes plainly marked. For instance, only operating tent equipment should be found in boxes marked "O. T.," "O. T. 1.," "O. T. 2.," etc.; only ward-tent equipment in boxes marked "W. T.," only dispensary outfit in boxes marked "D. T." Under this arrangement all boxes of stores can be easily sorted and arranged on reaching camp, and it will be unnecessary to transfer various articles packed in one box to different tents, as heretofore.

A complete catalogue of this equipment should be furnished to each medical officer accompanying the expedition.

A NEW BRIGADE MEDICAL OUTFIT.

By T. W. RICHARDS, surgeon, United States Navy.

The deficiencies in the so-called Regimental Medical Outfit of the Supply Table, pointed out by Surg. Hoyt in the preceding article, have long been appreciated, and the Bureau has recently assembled an entirely new type of outfit, which is about ready for issue at the Naval Medical Supply Depot in Brooklyn.

As long as the brigade operated as a unit the old type of outfit answered the purpose fairly well, but it has almost invariably happened that a force of marines split up into a number of small units which became widely separated; each of these required its own medical outfit. To cover this contingency the new outfit provides for the establishment of a brigade hospital, and also complete equipments for each individual regiment and company. It is hoped that the outfit now being assembled may be given a practical try out in the field under conditions simulating actual service, and after such changes as experience dictates it will officially replace the one now on the supply table.

The complete outfit will include 40 company equipments, 4 regimental equipments, and 1 brigade hospital equipment.

COMPANY EQUIPMENT (40).

Each to consist of:

(1) Company medical case, No. 1.

(2) Company surgical dressing pouch (may be later increased to 2), No. 1.

(3) Hospital Corps pouch, large, No. 1.

When a medical officer accompanies one or more companies, he shall be furnished with one surgical instrument case, small (No. 885, U. S. A. Req. 30½), from the regimental equipment.

REGIMENTAL EQUIPMENT (4).

Each to consist of:

(4) 1 chest, surgical (paragraph 894, Manual of Medical Department, U. S. A.); weight 100 lbs.

(5) 1 chest, medical (paragraph 889, Manual of Medical Department, U. S. A.); weight 100 lbs.

(6) 1 chest, sterilizer (paragraph 893, Manual of Medical Department, U. S. A.); weight 100 lbs.

(7) 1 chest, detached service (paragraph 888, Manual of Medical Department, U. S. A.); weight 100 lbs.

(8) 1 chest acetylene illuminating outfit (paragraph 886, Manual of Medical Department, U. S. A.); weight 74 lbs.

(9) 1 chest, calcium carbide, 80 lbs., U. S. N.
(10) 1 table, operating, folding, U. S. N.
(11) 1 typewriter, U. S. N.
(12) 1 chest of bedpans, U. S. N.
(13) 4 litters, U. S. A.
(14) 2 tent units, folding field furniture (paragraph 904, Manual of Medical Department, U. S. A.).
(15) 2 tent units, bedding and clothing (paragraph 903, Manual of Medical Department, U. S. A.).
(16) 2 dressing rolls for surgical dressings, filled, U. S. A.
(17) 2 emergency cases (paragraph 824, Manual of Medical Department, U. S. A.).
(18) 1 case hospital stores, U. S. N.
(19) 1 case, surgical, pocket, U. S. N.
(20) 1 form portfolio (U. S. N. forms).
(21) 2 cases, surgical instrument, small, U. S. A., No. 885.
For distribution to medical officers when on detached service with companies.

BRIGADE HOSPITAL EQUIPMENT (1).

To consist of:
(22) 1 outfit medicines, 5 chests (paragraph 860, Manual of Medical Department, U. S. A.).
(23) 1 case genito-urinary, U. S. N., large.
(24) 1 case general operating, large, U. S. N.
(25) 1 post-mortem case, U. S. N.
(26) 1 thermo cautery, U. S. N.
(27) 1 chest, mess, small (paragraph 892, Manual of Medical Department, U. S. A.).
(28) 4 boxes hospital stores (paragraph 896, Manual of Medical Department, U. S. A.).
(29) 1 table, operating, folding, U. S. N.
(30) 2 litters, U. S. A.
(31) 1 bathtub set (paragraph 882, Manual of Medical Department, U. S. A.).
(32) 1 field desk, U. S. A., filled with U. S. N. forms (paragraph 895, Manual of Medical Department, U. S. A.).
(33) 1 typewriter, U. S. N.
(34) 1 chest, sterilizer (paragraph 893, Manual of Medical Department, U. S. A.).
(35) 1 chest, acetylene illuminating outfit (paragraph 886, Manual of Medical Department, U. S. A.).
(36) 4 chests, commode (paragraph 887, Manual of Medical Department, U. S. A.).
(37) 4 chests, surgical dressings, U. S. N.

(38) 2 chests, calcium carbide (80 lbs., U. S. N.).

(39) 13 tent units, folding field furniture (paragraph 904, Manual of Medical Department, U. S. A.).

(40) 13 tent units, bedding and clothing (paragraph 903, Manual Medical Department, U. S. A.).

(41) 5 pouches, Hospital Corps, small, U. S. N.

(42) 1 case, pocket surgical, U. S. N.

(43) 2 cases haemostats, U. S. N.

(44) 200 first-aid packets, U. S. N.

Reserve supply for distribution in case original individual equipment has been used.

(45) 1 microscopic outfit.

SPECIAL USES OF COMPONENT PARTS.

It will appear, therefore, that this equipment provides: First, for the individual; second, for the company; third, for the regiment; and, fourth, for the brigade. The individual will be provided with a first-aid packet by his commanding officer; an ample supply of these packets is on hand at the depot of supplies, United States Marine Corps, Philadelphia, Pa.

The company medical case is for the purpose of supplying medicines to a company on detached service for a period of about 60 days.

The company pouch of surgical dressings is for the purpose of supplying a company on detached service with compact surgical dressings for a period of about 60 days.

A Hospital Corps pouch, large, will be carried by the member of the Hospital Corps accompanying a detached company.

When a medical officer accompanies a detached company, he will take with him a case of surgical instruments (small, U. S. A., No. 885) from the regimental equipment.

The regimental equipment is for the purpose of furnishing medical and surgical supplies to a regiment operating independently. When a regiment is a part of a brigade, with other regiments, a regimental hospital will not be established. When it is not a part of a brigade, a regimental hospital will be established when necessary.

The brigade hospital equipment is for the purpose of establishing a brigade hospital for the several regiments of the brigade. The bedding for the sick is to be supplied from the brigade medical outfit, the tentage by the marine quartermaster, who will also supply tentage and cots for the members of the Medical and Hospital Corps.

The brigade outfit is supplied with one additional regimental outfit, which is not to be used except in the event of an additional regiment being formed from the already existing regiments, i. e., four from three.

An additional supply of first-aid packets is included in the brigade hospital outfit for distribution in event of the supply of the marine quartermaster having been exhausted.

Wherever reference is made to the "Manual of the Medical Department, U. S. A.," the 1911 edition is indicated.

The following inventory is appended for reference:

	Company.	Regiment.	Brigade hospital.	Total.
First-aid packets			200	200
Company medical cases	40			40
Company surgical-dressing pouches	[1] 40			40
Hospital Corps pouches (large)	40			40
Hospital Corps pouches (small)			5	5
Case surgical instruments (small) United States Army, No. 885		8		8
Chest, surgical, United States Army, No. 894		4		4
Chest, medical, United States Army, No. 889		4		4
Chest, sterilizer, United States Army, No. 893		4	1	5
Chest, detached service, United States Army, No. 888		4		4
Chest, acetylene illuminating outfit, United States Army, No. 886		4	1	5
Chest, calcium carbide (80 pounds), United States Navy		4	2	6
Tables, operating, folding, United States Navy		4	1	5
Field desk, United States Army, No. 895 (filled with United States Navy forms)			1	1
Typewriter, United States Navy		4	1	5
Chest of bed pans, United States Navy		4		4
Litters, United States Army		16	2	18
Tent units, folding field furniture, United States Army, No. 904		8	13	21
Tent units, bedding and clothing, United States Army, No. 903		8	13	21
Dressing rolls for surgical dressings, United States Army, (filled)		8		84 8
Emergency cases, United States Army, No. 824		8		
Boxes hospital stores, United States Army, No. 896			4	4
Cases hospital stores, United States Navy		4		5
Cases, surgical pocket, United States Navy		4	1	4
Forms portfolio (United States Navy forms)		4		
General operating cases United States Navy (large)			1	1
Outfit of medicines, 5 chests, United States Army, No. 860			1	1
Case, genito-urinary, United States Navy (large)			1	1
Case, post-mortem, United States Navy			1	1
Thermo-cautery, United States Navy			1	1
Chest, mess, United States Army, No. 892 (small)			1	1
Bath-tub set, United States Army, No. 882			1	1
Chest, commodes, United States Army, No. 887			4	4
Chest, surgical dressings, United States Navy			4	4
Cases, hæmostats, United States Navy			2	2
Microscopical outfits			1	1

[1] May be increased to 80.

EARLY DIAGNOSIS OF CEREBROSPINAL MENINGITIS—REPORT OF 10 CASES.

By G. F. Cottle, passed assistant surgeon, United States Navy.

Before the days of Flexner's serum in the treatment of cerebrospinal meningitis the mortality of this disease was about 70–80 per cent. There were of course groups of cases which showed a lower mortality; but the average expectation of life during an epidemic could not then be put above 20 per cent. A great many series of cases have been reported since the serum has been in use and there has been a marked reduction in mortality in nearly every series, so that

at present a mortality of from 20 per cent to 50 per cent may be expected as an average during any particular epidemic. Flexner has reported 1,294 cases treated with his serum, with 894 recoveries and 400 deaths, a mortality of 30.9 per cent for the series.

In reading of epidemics occurring in different parts of the United States during the past few years it is not unusual to note that cases occurring early in an epidemic are not recognized as cerebrospinal meningitis until some days or perhaps many days after the first symptoms have been noted by the patient or his family or the physician. Once the disease is recognized in a community, the people and the physicians become alert and cases are brought earlier and earlier for serum treatment. As the epidemic progresses the mortality lessens. It is, of course, possible that as an epidemic advances the virulence of the particular strain of meningococcus becomes lowered and patients recover in larger numbers at the end than in the beginning of an epidemic for this reason, but considerable evidence is at hand to show that low mortality in this disease is largely due to early diagnosis and early administration of Flexner's serum.

If we study the cases reported by Flexner we find that he reports:

Serum given.	Number of cases.	Mortality.
		Per cent.
First to third day	199	[illegible]
Fourth to seventh day	346	[illegible]
Seventh and later	666	[illegible]

These figures show that serum treatment before the third day brings the mortality down to 18 per cent. These cases were collected from the practice of several physicians in this country.

If we take the series of 99 cases from the experience of Vetter and Debré [2] we find:

Serum given.	Number of cases.	Mortality.
		Per cent.
First to third day	44	[illegible]

Of these 44 cases treated before the third day, 9 died. The authors state that 7 of these fatal cases did not have a fair trial of the serum. If these 7 are excluded we have:

Serum given.	Number of cases (selected).	Mortality.
		Per cent.
First to third day	36	[illegible]

[1] Flexner, Jour. Exper. Med. N. Y., May, 1913, XVII, No. 5.
[2] Vetter and Debré: La Meningite cérébrospinale.

We know that in diphtheria if we wait three days before administering antitoxin a considerable percentage of our cases will die. We know that the doctor who looks with suspicion on every case of sore throat and recognizes by culture the presence of the diphtheria bacillus within 24 hours of the onset; and then uses antitoxin vigorously, practically never has a death from diphtheria. Is it not likely that the same degree of readiness to suspect cerebrospinal meningitis will bring about a reduction of mortality in this disease comparable to that which has occurred in diphtheria?

During the period of my tour of duty at the United States Naval Training Station, Great Lakes, Illinois, from December 26, 1911, to November 10, 1913, there have been treated 10 cases of cerebrospinal meningitis, 8 in the fall and winter of 1911–12, and 2 in the fall of 1913. The cases developed in the service of Surg. J. S. Taylor, United States Navy, to whom I am indebted for the privilege of reporting the final results of treatment:

Serum given.	Number of cases.	Mortality.
First day	8	0
Second day	2	0

In eight of the cases the diagnosis was made and treatment begun within 24 hours of the onset; in two of the cases mumps was present at the onset and so obscured the diagnosis that serum was not given until nearly 48 hours had elapsed.

In considering the fact that 10 consecutive cases of cerebrospinal meningitis have been treated here without a death it must be pointed out that these patients were all young men between 17 and 25 years of age, and that they were recruits in excellent physical condition. Youth and a robust constitution are great factors in the reduction of mortality in most diseases. That a strain of meningococcus of low virulence was present in these cases does not seem likely, for in spite of the very early administration of serum the majority were very sick; one had a double lobar pneumonia complicating the onset; another a protracted course with multiple arthritis and septicemia; two had a relapse after about 10 days of freedom from symptoms; two became deaf, one in one ear and one in both ears; and of these seriously sick patients, two became blind.

In civil practice and in civil hospitals sick people often delay in reaching a doctor because of pecuniary or other reasons. It is therefore difficult for the civil practitioner to see cases of this disease in the first few hours after the onset. In the naval service a doctor is almost always at hand and the men are trained to go to the sick bay in the early stage of illness. In a disease which develops with such

lightning-like rapidity as cerebrospinal meningitis the naval doctor is therefore in a position to observe and study the earliest symptoms. Moreover, past experience has taught the naval service that in the stream of recruits flowing into our training stations, this disease is apt to appear from time to time, probably imported from districts where it is or has been present. This knowledge places the medical officer of such a station in an attitude of special watchfulness for the disease and it is believed that a consideration of the early symptoms observed in this series of cases may be of some interest.

These cases have taught us that it is possible to diagnose this disease the day of its onset, and that an early diagnosis should be made if we are to save the number of cases which the efficiency of the Flexner serum warrants. These cases have made us feel that an early diagnosis is one made in the first hours of the disease, not in the first few days. They have shown us that to wait for the clinical signs of meningitis laid down in the textbooks is to wait too long. They have made us seek a mode of diagnosis, not new, but one which if followed will often insure recognition of the disease at a stage when treatment will do the most good.

If we may typify the case histories of these 10 patients the following would be the usual story: Patient comes to sick bay with a headache and looks a bit sick, as a rule there is some elevation of temperature, 101° to 103° or more. He is sick enough to be put to bed. He may or he may not have vomited. Inquiry may bring out that he has had a cold in his head or that he had some slight malaise the preceding day. At this time his mind is clear. In an hour or so after being put to bed or in some cases after a night of comparative comfort he begins to complain bitterly of headache. He may toss about or merely lie in bed holding his head between his hands or he may get up and walk about, declaring he can not stand the pain. Rarely his headache may be complained of only when he is questioned. If an ice bag or coal-tar drugs have been ordered it will be noted that they do not control his pain. Almost simultaneously with the onset of severe headache there comes, even this early, a disturbance of consciousness. This is a real symptom, but unless looked for may be obscured by the more definite symptom, headache. Before the onset of real mental dullness there will be a period in which, in the intervals when the patient is not complaining of pain, he will be seen to have a "far-away" look, he will, when directly questioned, answer intelligently, but when not directly addressed his consciousness seems behind a cloud. He has lost that acute interest in his surroundings which is normal.

This is the stage of the disease when a diagnosis should be made, and fortunately the doctor who is lucky enough to get a case of cerebrospinal meningitis in this stage need not await a further

unfolding of the clinical course of the disease. He can, in most cases, conclusively affirm or deny the presence of the disease at this time by following a routine procedure, known a long time, but not often enough followed in the presence of the symptom, severe headache.

Once the suspicion of meningitis has been aroused in the mind of the physician, stiffness of the dorsal muscles of the neck should be sought. To demonstrate this sign, the hand of the physician is placed beneath the occiput of the patient as he lies in bed, and gently an attempt is made to flex the head upon the trunk. In meningitis in the very early stage there may be only a lessening of the normal range of flexion or the attempt to flex may bring to the patient's face an expression of pain, or he may even cry out with pain and sharply ask the doctor to leave him alone. This symptom has been so constantly present that it is almost pathognomonic. Its absolute absence is as valuable as its presence. We can not too strongly emphasize that its value is greatly enhanced if the procedure is carried out slowly and with extreme gentleness on the doctor's part. One may compare the value of this sign with the value of muscular rigidity in the diagnosis of abdominal conditions. Properly sought, it is valuable; quickly or roughly sought, it is of little value. One should seek for stiffness of the dorsal neck muscles in the presence of severe headache in the same routine manner that one feels for muscular rigidity of the rectus when there is pain in the abdomen.

When headache and stiffness of the dorsal neck muscles are present, the doctor should not be content to leave his patient or to prescribe treatment until he has taken a leucocyte count. If this is high (15,000 to 40,000), a lumbar puncture should at once be made, and a cloudy spinal fluid should be the signal for the immediate injection of the Flexner serum. In the presence of a cloudy spinal fluid, it is safer to give Flexner's serum at once than to wait a careful examination of the centrifuged spinal fluid to determine the presence or absence of the meningococci. The meningococci are not always present in the spinal fluid in cerebrospinal meningitis, but cloudiness means leucocytes, and they mean meningitis. The serum can do no harm, but even a slight delay may mean death or serious complications.

If, in the presence of headache and stiffness of the dorsal neck muscles, one waits for other symptoms of meningitis to appear, the picture found in the textbooks will rapidly unfold; projectile vomiting will occur; a rash will be found on the abdomen or trunk; Kernig's sign will be demonstrable; increased reflexes, cremasteric or patellar, will develop; mental dullness will appear and then coma supervene. At a slightly later stage will come cranial nerve involvements, photophobia, strabismus, blindness, or deafness.

That alertness to recognize the disease and speed in diagnosis are necessary is obvious when we remember that in every epidem there are cases which go from onset to death in the course of a sing day, and that one case, at least, is on record [1] in which from onset death the hours numbered but nine. It can hardly be hoped save these extremely abrupt and fulminating cases, but there are large number of cases in which valuable time may be lost unless suspect the disease when headache is complained of and unless seek the early signs of meningitis in a routine manner.

As an aid to diagnosis, it is well worth noting that even early the disease a peculiarity of the relation of temperature, pulse, and respiration is to be observed. In two of our cases, while we were watching the headache in the first hour or so, the temperature, pulse and respiration were taken every 15 minutes, and it was noted th there was a disturbance of the normal relationship. Thus the rec of one of the cases was as follows:

	Temperature.	Pulse.	Re[illegible]
First	102	110	
Second (15 minutes later)	102.6	106	
Third (15 minutes later)	102	84	
Fourth (15 minutes later)	102	92	

The pulse, temperature, and respiration ratio was markedly out of relation even this early.

To summarize, experience with these cases seems to teach that severe headache with or without vomiting should be looked up with suspicion and stiffness of the dorsal neck muscles sought; that in the presence of these symptoms a leucocyte count should at once be made; that a high count should be followed by spinal puncture and that the withdrawal of cloudy spinal fluid should be the signal for immediate injection of Flexner's serum.

COMMENTS ON MISTAKES MADE WITH THE NOMENCLATURE, 1913 ABSTRACT OF PATIENTS (FORM F), AND THE STATISTICAL REPORT (FORM K).

By C. E. Alexander, pharmacist, United States Navy.

The arrangement of and instructions on the above and other bureau forms may at times appear arbitrary and without apparent reason; but all the requirements have a specific use to those interested in the recording and combining of statistics and a strict adherence to the provisions will save time and trouble for all.

An unnecessarily large number of mistakes are of a clerical nature and show carelessness on the part of the individual who prepares

[1] Holt: Diseases of Children.

the report. In copying from a rough to a smooth form and before they are forwarded, they should be compared with another person and reference made to the previous report to see that all continuations have been properly taken up.

NOMENCLATURE, 1913.

Only the terms of the nomenclature, as noted therein, should be used. Although the instructions state that "No other titles than those of the following list are to be used in official returns," yet it frequently happens that terms not listed are used. Several items of the nomenclature have clauses in parentheses which it was intended need not be used; but experience has demonstrated that it is not safe to omit these clauses, as many mistakes are made when they are not used; particularly is this true with injuries.

Diagnoses listed under "Diseases" should never be given key letters, but all items listed under "Injuries" should always be given key letters. When assigning key letters to injuries a careful study should be made of the classified cause and if it appears that there is no letter from A to K, inclusive, that can be properly assigned, then the key letter "L" should be used. Do not record an injury without a key letter.

Much trouble is experienced with diseases of chancroidal, gonococcal and syphilitic origin. Adenitis, lymphadenitis and lymphangitis when due to chancroid should be returned as "Chancroid of lymph node." Balanitis, cystitis, epididymitis, orchitis, prostatitis, etc., when due to gonococci, except as provided for, should be returned as "Gonococcus infection, unqualified." Syphilitic ulcers or other manifestations of the disease should be returned as "Syphilis."

"Jaundice, acute infective" (Weil's disease), should not be used as a diagnosis for ordinary cases of catarrhal jaundice for which there are terms specified in the nomenclature, such as "Cholangitis, acute," etc.

The provisions of the nomenclature instructions, article 31 (patients transferred to civil hospitals), article 34 (diagnosis undetermined), and article 35 (proper method for recording totals on Form K), are plainly self-explanatory and should be followed. The use of the term "Diagnosis undetermined" is being abused: many cases of a trivial nature are transferred with this title, when it appears that time and clinical means are available or symptoms should be present to establish a diagnosis.

The use of the terms of the nomenclature in connection with the preparation of reports of death should receive more consideration. Many reports of death show a diagnosis with which the patient was carried on the sick list, while the body of the report may show the

cause of death to be something entirely different; e. g., a case of "poisoning by ether anæsthesia" was returned as "Cause of death: fracture, simple, of forearm, 'G'." This and other cases should have been discharged as "C" and admitted "A" with the diagnosis which was the immediate cause of death before the report of death was written.

ABSTRACT OF PATIENTS (FORM F).

Although required by the instructions on the "Abstract of patients (Form F)," the names do not always occur in strictly alphabetical order. It is not intended that this arrangement should apply only to the first letter, but to the fullest dictionary arrangement of the name.

It is very often difficult to determine a grade or rate, especially when the abbreviations are similar. The use of the following is suggested:

OFFICERS.

Rear admiral	R-Ad.
Captain	Capt.
Commander	Comdr.
Lieutenant commander	Lt-C.
Lieutenant	Lt.
Lieutenant (junior grade)	Lt-jg.
Ensign	Ens.
Midshipman	Mid-1, Mid-2, etc.
Medical director	MDir.
Medical inspector	MIns.
Surgeon	Surg.
Passed assistant surgeon	PAS.
Assistant surgeon	ASurg.
Acting assistant surgeon	AAS.
Acting assistant dental surgeon	AADS.
Pay director	PDir.
Pay inspector	PIns.
Paymaster	Pay.
Passed assistant paymaster	PAP.
Assistant paymaster	APay.
Chaplain	Chap.
Professor of mathematics	PMath.
Naval constructor	NCon.
Assistant naval constructor	ANCon.
Civil engineer	CEng.
Assistant civil engineer	ACEng.
Boatswain	CBoat or Boat.
Gunner	CGun or Gun.
Machinist	CMach or Mach.
Carpenter	CCarp or Carp.
Sailmaker	CSail or Sail.
Pharmacist	CPharm or Pharm.
Major general commandant	MGComM.
Colonel	ColM.

Lieutenant colonel	LtCM.
Major	MajM.
Captain	CapM.
First lieutenant	1-Lt.
Second lieutenant	2-Lt.

SEAMAN BRANCH.

Master at arms	CMatA, MatA-1, MatA-2, MatA-3.
Boatswain's mate	CBM, BM-1, BM-2.
Gunner's mate	CGM, GM-1, GM-2, GM-3.
Turret captain	CTC, TC-1.
Quartermaster	CQr, Qr-1, Qr-2, Qr-3.
Coxswain	Cox.
Seaman gunner	SeaG.
Seaman	Sea.
Ordinary seaman	OS.
Apprentice seaman	AS.

ARTIFICER BRANCH.

Machinist's mate	CMM, MM-1, MM-2.
Electrician	CEl, El-1, El-2, El-3.
Carpenter's mate	CCM, CM-1, CM-2, CM-3.
Water tender	CWT, WT.
Boilermaker	Bmkr.
Coppersmith	Csmth.
Shipfitter	Sfit-1, Sfit-2.
Blacksmith	Blks.
Plumber and fitter	P&F.
Sailmaker's mate	SmM.
Painter	Ptr-1, Ptr-2, Ptr-3.
Oiler	Oiler.
Printer	Print.
Fireman	F-1, F-2.
Shipwright	Swrt.
Coal passer	CP.

SPECIAL BRANCH.

Yeoman	CY, Y-1, Y-2, Y-3.
Hospital steward	HS.
Bandmaster	Band.
Commissary steward	CCms, CmS.
First musician	1 Mus.
Ship's cook	SC-1, SC-2, SC-3, SC-4.
Baker	Bak-1, Bak-2.
Hospital apprentice	HA-1, HA.
Musician	Mus-1, Mus-2.
Bugler	Bugler.
Landsman	Lds.

MESSMEN BRANCH.

Stewards to C in C	SCinC.
Cooks to C in C	CCinC.
Stewards to commandant	SCom.

Cook to commandant	CCom.
Cabin steward	CabS.
Cabin cook	CabC.
Wardroom steward	WRS.
Wardroom cook	WRC.
Steerage steward	StS.
Steerage cook	StC.
Warrant officers' steward	WOS.
Warrant officers' cook	WOC.
Mess attendant	MsA-1, MsA-2, MsA-3.

MARINE CORPS.

Sergeant	Sergt.
Corporal	Corp.
Private	Pvt.

Under "Diagnosis" on Form F only the terms of the nomenclature as noted therein should be used, or unmistakable abbreviations of the terms. It frequently happens that "Key letters" are missing from the column in which they belong after injuries.

STATISTICAL REPORT (FORM K).

As each sheet of this form is used for different purposes it is necessary that the name of the place and period that the report covers be entered on each sheet. In the case of ships the name of the ship only should appear as the location of the ship at the time the report is made is of no use and should not be given. All ships except receiving ships should give under the "Summary of cruise" the location of the ship during the quarter. This applies to all ships, whether in reserve or not. This may appear unnecessary, but if you consider that the reports are kept for future use in a year or two it will not be remembered whether the ship was with the fleet, cruising separately, or in reserve.

On page 3 of Form K, under "Diagnosis undetermined," no entry should be made of your own original cases, and it is impossible to prepare this table unless a case is received from some other place, in which event an entry should appear. On page 4, "Invalided to hospital or transferred," under "Disposition," the name of the place to which a patient is sent should appear, e. g., H–New York, T–USS *Idaho*, etc. On page 5 and subsequent pages for disabilities only the terms of the nomenclature or unmistakable abbreviations should be used; not more than one diagnosis should be entered between lines, but more than one line may be used for the recording of a diagnosis if desired. Diseases should be listed separately, followed by their totals, and injuries should be treated in the same manner, then totals for both recorded as shown in article 35 of the nomenclature. A great deal of time and trouble, necessitating delays through cor-

respondence and return of forms is caused by not properly preparing and comparing this portion of Form K before forwarding. Many mistakes are made by placing figures in the wrong columns and in adding up the columns. One of the most discouraging things for the statistician to contend with is the taking up of cases from a previous quarter with different diagnoses and different key letters from those recorded on the previous quarter.

CLASSIFICATION OF THE UNITED STATES NAVY NOMENCLATURE, 1913.

By C. E. ALEXANDER, pharmacist, U. S. Navy.

For the information of the service the following lists are published showing the classification of the nomenclature as used by the Bureau of Medicine and Surgery for combining diseases and injuries for statistical purposes.

These lists may also be of use in the selection of a diagnosis, as under each class heading occur the items deemed desirable for use. In several of the tables in the Surgeon General's report, where class headings are used for combinations, some idea may be had as to the items used in making up the report.

CLASSIFICATION OF DISEASES AND INJURIES, UNITED STATES NAVY NOMENCLATURE, 1913.

CLASS I. Diseases of blood.
II. Diseases of circulatory system.
III. Diseases of digestive system.
IV. Diseases of ductless glands and spleen.
V. Diseases of ear.
VI. Diseases of eye and annexa.
VII. Diseases of genito-urinary system (nonvenereal).
VIII. Diseases of infective type (nonvenereal).
IX. Diseases of infective type (venereal).
X. Diseases of lymphatic system.
XI. Diseases of mind.
XII. Diseases of motor system.
XIII. Diseases of nervous system.
XIV. Diseases of respiratory system.
XV. Diseases of skin, hair, and nails.
XVI. Herniæ.
XVII. Miscellaneous diseases and conditions.
XVIII. Parasites (fungi and certain animal parasites).
XIX. Tumors.
XX. Injuries.
XXI. Poisons.

CLASS I. *Diseases of blood.*

Anemia, pernicious.
Anemia, simple.
Anemia, splenic.
Hemophilia.
Leukemia.
Polycythemia, chronic.
Purpura.
Purpura, hemorrhagic.

CLASS II.—*Diseases of circulatory system.*

Aneurism.
Aneurysm, cirsoid.
Aneurysm, of heart.
Aneurysm, varicose.
Aneurysmal varix.
Angina pectoris.
Aortitis.
Arterial sclerosis, general.
Atrophy of heart.
Bradycardia.
Dilatation, acute cardiac.
Dilatation, chronic cardiac.
Embolism.
Endocarditis, acute.
Endocarditis, chronic.
Fatty heart.
Heart block.
Hypertrophy of heart.
Mediastino-pericarditis.
Myocarditis, acute.
Myocarditis, chronic.
Palpitation, cardiac.
Pericarditis.
Pericardium, adherent.
Phlebitis.
Pneumopericardium.
Pyopneumopericardium.
Rupture of heart, spontaneous.
Tachycardia.
Thrombosis.
Valvular disease, chronic cardiac.
Varix.

CLASS III.—*Diseases of digestive system.*

Abscess about rectum.
Abscess of liver.
Abscess of omentum.
Abscess of pharynx.
Abscess of salivary gland.
Abscess of tongue.
Abscess, subphrenic.
Achylia gastrica.
Adhesions about gall bladder.
Adhesions about stomach.
Adhesions of peritoneum.
Angina ludovici.
Appendicitis, acute.
Appendicitis, chronic.
Artificial anus.
Atony of stomach.
Atrophy of liver, acute yellow.
Atrophy of pancreas.
Atrophy of stomach.
Atrophy of tongue.
Autointoxication, intestinal.
Calculus of pancreas.
Cardiospasm.
Caries of tooth.
Cholangitis, acute.
Cholangitis, chronic.
Cholecystitis, acute.
Cholecystitis, chronic.
Cholelithiasis.
Chyle cyst of mesentery.
Chylous ascites, nonfilarial.
Cirrhosis of liver, atrophic.
Cirrhosis of liver, hypertrophic.
Colitis, acute.
Colitis, chronic.
Concretions in salivary gland.
Concretion in tonsil.
Constipation.
Deformity of liver, acquired.
Deformity of palate, acquired.
Deformity of stomach, acquired.
Dilatation of esophagus.
Dilatation of stomach, acute.
Dilatation of stomach, chronic.
Displacement of liver.
Diverticulitis.
Diverticulum of esophagus.
Diverticulum of intestines, acquired.
Duodenitis.
Elongation of uvula.
Enteritis, acute.
Enteritis, chronic.
Enterocolitis.
Enterolith.
Esophagitis.
Fatty liver.

CLASS III.—*Diseases of digestive system*—Continued.

Fermentation, gastric.
Fermentation, intestinal.
Fissure of anus.
Fistula, biliary.
Fistula, fecal.
Fistula in ano.
Fistula of (salivary gland or duct).
Foreign body in esophagus.
Foreign body in intestines.
Foreign body in pharynx.
Foreign body in rectum.
Foreign body in stomach.
Functional derangement of liver.
Gaseous tumor of parotid.
Gastritis, acute catarrhal.
Gastritis, chronic catarrhal.
Gastritis, acute phlegmonous.
Gastroduodenitis.
Gastroenteritis.
Gastroptosis.
Gingivitis.
Glossitis, acute.
Glossitis, chronic.
Hematemesis.
Hemorrhage, intestinal.
Hemorrhoids.
Hyperchylia, gastric.
Hypertrophy of tonsil.
Hyperchlorhydria.
Impacted feces.
Inflammation of salivary gland.
Nervous dyspepsia.
Neurosis, intestinal.
Neurosis of pharynx.
Obstruction, acute intestinal.
Obstruction, chronic intestinal.
Obstruction of pancreatic duct.
Obstruction of portal vein.
Pancreatitis, acute.
Pancreatitis, chronic.
Peritonitis, acute, general.
Peritonitis, acute, local.
Peritonitis, chronic, general.
Peritonitis, chronic, local.
Perihepatitis.
Perversion of appetite.
Pharyngitis, acute.
Pharyngitis, chronic.
Pneumophagia.
Proctalgia.
Proctitis.
Prolapse of rectum.
Pylephlebitis.
Pyloric incontinence.
Pylorospasm.
Pyorrhoea alveolaris.
Reguritation of stomach.
Rumination.
Rupture of esophagus, spontaneous.
Spasm of esophagus.
Spasm of rectum.
Splanchnoptosis.
Sprue.
Stenosis of gall duct.
Stenosis of pylorus.
Stomatitis.
Stomatitis, gangrenous.
Stricture of esophagus.
Stricture of intestine.
Stricture of pharynx.
Stricture of rectum.
Tonsillitis, acute follicular.
Tonsillitis, chronic.
Torsion of omentum.
Ulcer of duodenum.
Ulcer of intestines.
Ulcer of mouth.
Ulcer of rectum.
Ulcer of stomach.
Ulceromembranous angina.
Vomiting, recurrent.
Xerostomia.

CLASS IV.—*Diseases of ductless glands and spleen.*

Abscess of spleen.
Acromegaly.
Addison's disease.
Cretinism.
Exophthalmic goitre.
Goitre.
Hemorrhage into parathyroid gland.
Hemorrhage into suprarenal gland.
Infarct of spleen.
Myxedema.
Perisplenitis.
Persistent thymus gland.
Rupture of spleen, spontaneous.
Splenitis, acute.
Splenitis, chronic interstitial.
Splenoptosis.
Thyroiditis, acute.
Thyroiditis, chronic.

CLASS V.—*Diseases of ear.*

Ankylosis of ossicles.
Caries of ossicle.
Cerumen, accumulation of.
Deafness.
Deformity of external ear, acquired.
Eustachian salpingitis, acute.
Eustachian salpingitis, chronic.
Foreign body in auditory canal.
Hematoma of external ear, nontraumatic.
Hemorrhage into labyrinth.
Mastoiditis, acute.
Mastoiditis, chronic.
Myringitis, acute.
Myringitis, chronic.
Ossification of auricle.
Otitis externa.
Otitis interna, acute.
Otitis, interna, chronic.
Otitis media, acute.
Otitis media, chronic.
Perichondritis of auricle.

CLASS VI.—*Diseases of eye and annexa.*

Abscess of eye and annexa.
Absence of lens.
Amaurosis.
Amblyopia.
Ankyloblepharon.
Astigmatism.
Atrophy of optic nerve.
Blepharitis.
Cataract.
Chalazion.
Choroiditis.
Color blindness.
Conjunctivitis, acute.
Conjunctivitis, chronic.
Conjunctivitis, phlyctenular.
Cramp of ciliary muscle.
Cyclitis.
Dacryoadenitis.
Dacryocystitis.
Detachment of choroid.
Detachment of retina.
Ectropion.
Entropion.
Epiphora.
Fistula of lachrymal sac.
Fistula of nasal duct.
Glaucoma, acute.
Glaucoma, chronic.
Hemianopsia.
Hemorrhage into retina.
Hemorrhage under conjunctiva, nontraumatic.
Hordeolum.
Hyperasthesia of retina.
Hyperemia of conjunctiva.
Hypermetropia.
Hypopyon.
Insufficiency of ocular muscle.
Iridochoroiditis.
Iridocylitis.
Iritis.
Keratitis.
Keratitis, phlyctenular.
Keratoiritis.
Leukoma.
Myopia.
Neuritis, optic.
Neuroretinitis.
Night blindness.
Nystagmus.
Opacity of vitreous humor.
Ophthalmoplegia.
Panophthalmitis.
Paralysis of ocular muscle.
Presbyopia.
Pterygium.
Retinitis.
Scleritis.
Snow blindness.
Staphyloma of cornea.
Stenosis of nasal duct.
Stenosis of punctum lacrimale.
Symblepharon.
Synechia.
Trachoma.
Trichiasis.
Ulcer of eye and annexa.
Xerosis.

CLASS VII.—*Diseases of genito-urinary system (nonvenereal.)*

scess about urethra.
scess of bladder wall.
scess of Cowper's glands.
scess of kidney.
scess of kidney, perinephritic.
scess of prostate gland.
scess of scrotum.
hesions, preputial.
buminuria.
ony of bladder.
rophy of prostate.
rophy of testicle.
cteriuria.
lanoposthitis.
lculus in bladder.
lculus in prostate.
lculus in ureter, impacted.
lculus in urethra, impacted.
ylocele, nonfilarial.
yluria, nonfilarial.
ncretion in seminal vesical.
ncretions, preputial.
ngestion of kidney.
stitis, acute.
stitis, chronic.
st of kidney.
formity of bladder, acquired.
formity of penis, acquired.
formity of urethra, acquired.
largement of prostate.
ididymitis, acute.
ididymitis, chronic.
travasation of urine.
stula, intestino-ureteral.
stula, intestino-vesical.
stula of bladder.
stula of kidney.
stula of ureter.
stula of urethra.
stula, recto-urethral.
stula uretero-vesical.
stula, urethro-vesical.
reign body in bladder.
reign body in ureter.
reign body in urethra.
necystitis, acute (nonvenereal).
necystitis, chronic (nonvenereal).
Hematocele of spermatic cord.
Hematoma of spermatic cord, nontraumatic.
Hematuria, renal.
Hemoglobinuria.
Hydrocele of spermatic cord.
Hydrocele of tunica vaginalis.
Hydronephrosis.
Impotence.
Incontinence of urine.
Infarct of kidney.
Inflammation of spermatic cord.
Masturbation.
Nephralgia.
Nephritis, acute.
Nephritis, chronic interstitial.
Nephritis, chronic parenchymatous.
Nephritis, disseminated, suppurative.
Nephrolithiasis.
Nephroptosis.
Neurosis of bladder.
Orchitis, acute.
Orchitis, chronic.
Paraphimosis.
Phimosis.
Prostatitis, acute.
Prostatitis, chronic.
Pyelitis.
Pyelonephritis.
Redundant prepuce.
Redundant scrotum.
Sclerosis of corpus cavernosum.
Seminal emissions.
Spermatocele.
Spermatorrhea.
Sterility.
Stricture of ureter.
Stricture of urethra.
Suppression of urine.
Torsion of spermatic cord, nontraumatic.
Ulcer of bladder.
Ureteral colic.
Ureteritis.
Urethritis, acute.
Urethritis, chronic.
Varicocele.

CLASS VIII.—*Diseases of infective type (nonvenereal).*

Abscess, unqualified.
Aerogenes capsulatus infection.
Anthrax.
Carbuncle.
Carrier, comma bacillus.
Carrier, diphtheria bacillus.
Carrier, typhoid bacillus.
Cellulitis.
Cerebrospinal fever.
Chicken pox.
Cholera, asiatic.
Dengue.
Diphtheria.
Dysentery, bacillary.
Dysentery, unclassified.
Erysipelas.
Fever of unknown cause.
Foot-and-mouth disease.
Furunculosis.
Gangosa.
Gangrene, infective.
German measles.
Glanders.
Hemoglobinuric fever.
Histoplasmosis.
Influenza.
Jaundice, acute infective.
Kala-azar.
Leprosy.
Malaria.
Measles.
Miliary fever.
Mumps.
Oriental sore.
Pappataci fever.
Paratyphoid fever.
Pellagra.
Plague.
Poliomyelitis, acute anterior.
Poliomyelitis, chronic anterior.
Poliomyelitis, acute bulbar.
Rabies.
Relapsing fever.
Rheumatic fever, acute.
Rheumatic fever, subacute.
Rocky Mountain spotted fever.
Scarlet fever.
Septicemia.
Smallpox.
Tetanus.
Tuberculosis, abdominal.
Tuberculosis, acute broncho-pneumo
Tuberculosis, acute, general.
Tuberculosis, acute pneumonic.
Tuberculosis, acute pulmonary milia
Tuberculosis, chronic pulmonary.
Tuberculosis of bronchus.
Tuberculosis of joint.
Tuberculosis of larynx.
Tuberculosis of pleura.
Tuberculosis of spinal column.
Tuberculosis of trachea.
Tuberculosis, unqualified.
Tuberculous meningitis.
Typhoid fever.
Typhus fever.
Undulant fever.
Vaccinia.
Veldt sore.
Verruca peruana.
Whooping cough.
Yaws.
Yellow fever.

CLASS IX.—*Diseases of infective type (venereal).*

Chancroid.
Chancroid of lymph-node.
Gonococcus infection of conjunctiva.
Gonococcus infection of joints.
Gonococcus infection of lymph-node
Gonococcus infection of urethra.
Gonococcus infection, unqualified.
Syphilis.

CLASS X.—*Diseases of lymphatic system.*

Abscess of axilla.
Abscess of lymph-node.
Elephantiasis, nonfilarial.
Fistula of thoracic duct.
Hodgkin's disease.
Lymphadenitis, acute.
Lymphadenitis, chronic.
Lymphangiectasis.
Lymphangitis.
Status lymphaticus.

CLASS XI.—*Diseases of mind.*

Constitutional inferiority.
Constitutional psychopathic state.
Dementia, cause unknown.
Dementia, paralytica.
Dementia, praecox.
Imbecility.
Melancholia, involutional.
Paranoia.
Paranoic state.
Psychasthenia.
Psychosis, due to organic brain disease.
Psychosis, epileptic.
Psychosis (exhaustive, infective, and toxic).
Psychosis, hysterical.
Psychosis, intoxication.
Psychosis, manic depressive.
Psychosis, polyneuritic.
Psychosis, senile.
Psychosis, traumatic.

CLASS XII.—*Diseases of motor system.*

Amyotonia congenita.
Ankylosis of joint.
Arthritis, acute.
Arthritis, chronic.
Arthritis, deformans.
Atrophy of (bone or cartilage).
Atrophy of muscle.
Bursitis, acute.
Bursitis, chronic.
Calcification of cartilage.
Chondritis.
Chondromalacia.
Contracture of joint.
Contracture of (muscle, fascia, tendon, or sheath).
Coxa valga.
Coxa vara.
Cramp of muscle.
Curvature of spine.
Ganglion.
Genu recurvatum.
Genu valgum.
Genu varum.
Hallux valgus.
Hallux varus.
Hammer toe.
Hemorrhage into joint, nontraumatic.
Hernia of (muscle, fascia, tendon, or sheath).
Hypertrophy of bone.
Leontiasis ossea.
Loose body in joint.
Loss of substance of (bone or cartilage).
Mallet finger.
Metatarsalgia.
Myositis, acute.
Myositis, chronic.
Myositis, progressive ossifying.
Myositis, traumatic ossifying.
Myotonia, congenital.
Necrosis.
Ossification of cartilage, unqualified.
Osteitis deformans.
Osteomalacia.
Osteomyelitis, acute.
Osteomyelitis, chronic.
Paralysis, muscle, ischemic.
Periostitis, acute.
Periostitis, chronic.
Pes cavus.
Pes planus.
Talipes.
Tenosynovitis.
Trigger finger.
Union of fracture, faulty.

CLASS XIII.—*Diseases of nervous system.*

Abscess of brain.
Anemia of brain.
Angiospastic edema.
Aphasia.
Apoplexy.
Arterial sclerosis, cerebral.
Ataxia, hereditary.
Athetosis.
Caisson disease.
Catalepsy.
Chorea.
Chorea, chronic progressive.
Cyst of brain.
Dystrophy, progressive muscular.
Encephalitis, acute.
Epilepsy.

CLASS XIII.—*Diseases of nervous system*—Continued.

Epilepsy, Jacksonian.
Hematomyelia.
Hematorrhachis.
Hemiplegia, old.
Hemorrhage, epidural.
Hemorrhage into cerebellum.
Hemorrhage into cerebrum.
Hemorrhage into medulla.
Hemorrhage into pons.
Hemorrhage, subdural.
Hernia of brain.
Hiccough.
Hydrocephalus, acquired.
Hypochondriasis.
Hysteria.
Locomotor ataxia.
Ménière's disease.
Meningitis, cerebral.
Meningitis, cerebrospinal.
Meningitis, spinal.
Myasthenia gravis.
Myelitis, disseminated.
Myelitis, transverse.
Neuralgia.
Neurasthenia.
Neuritis.
Neuritis, multiple.
Neurosis, occupational.
Neurosis, traumatic.
Pachymeningitis, cerebral.
Pachymeningitis, spinal.
Paralysis, acute ascending.
Paralysis, agitans.
Paralysis, Brown-Sequard's.
Paralysis of nerve.
Paramyoclonus multiplex.
Paraplegia, ataxic.
Sclerosis, amyotrophic lateral.
Sclerosis, disseminated.
Sclerosis, lateral.
Somnambulism.
Spasm habit.
Spasm nodding.
Spasm saltatory.
Stammering.
Stuttering.
Syringomyelia.
Tic, convulsive.
Tic, coordinated.
Tic, psychical.
Zoster.

CLASS XIV.—*Diseases of respiratory system.*

Abscess of larynx.
Abscess of lung.
Abscess of nasal septum.
Adenoids.
Adhesions of epiglottis.
Ankylosis of arytenoid cartilage.
Anosmia.
Asthma.
Bronchiectasis.
Bronchitis, acute.
Bronchitis, chronic.
Bronchitis, fibrinous.
Chylothorax.
Congestion of lung, acute.
Deformity of nose, acquired.
Deviation of nasal septum.
Edema of glottis.
Edema of lung.
Emphysema, pulmonary.
Epiglottiditis.
Epistaxis.
Fistula of larynx.
Fistula of trachea.
Fistula, thoraco-intestinal.
Foreign body in bronchus.
Foreign body in frontal sinus.
Foreign body in larynx.
Foreign body in maxillary sinus.
Foreign body in nasal passage.
Foreign body in trachea.
Gangrene of lung.
Hay fever.
Hemoptysis.
Hemothorax.
Hernia of lung.
Infarct of lung.
Laryngitis, acute.
Laryngitis, chronic.
Neurosis of larynx.
Ossification of larynx.
Ossification of tracheal rings.
Ozena.
Paralysis of vocal cords.
Perforated nasal septum.
Perichondritis of larynx.
Pleurisy, acute fibrinous.
Pleurisy, chronic fibrinous.
Pleurisy serofibrinous.

CLASS XIV.—*Diseases of respiratory system*—Continued.

Pleurisy, suppurative
Pleuritic adhesions.
Pneumatocele capitis.
Pneumonia, broncho-.
Pneumonia, interstitial.
Pneumonia, lobar.
Pneumonoconiosis.
Pneumothorax.
Polypus, nasal.
Pyopneumothorax.
Rhinitis, acute.
Rhinitis, chronic.
Rhinitis, hypertrophic.
Rhinolith.
Sinusitis, ethmoidal.
Sinusitis, frontal.
Sinusitis, maxillary.
Sinusitis, sphenoidal.
Spur on nasal septum.
Stenosis of bronchus.
Stenosis of larynx.
Stenosis of trachea.
Tracheitis.
Tracheocele.
Ulcer of bronchus.
Ulcer of epiglottis.
Ulcer of nasal passage.
Ulcer of trachea.

CLASS XV.—*Diseases of skin, hair, and nails.*

Acne.
Alopecia.
Alopecia areata.
Angiokeratoma.
Anidrosis.
Atrophy of skin.
Bromidrosis.
Callositas.
Chilblain.
Chloasma.
Chromidrosis.
Cicatrix of skin.
Clavus.
Comedo.
Cornu.
Dermatitis gangrenosa.
Dermatitis venenata.
Dermatitis, unqualified.
Dysidrosis.
Ecthyma.
Eczema.
Erythema multiforme.
Erythema nodosum.
Erythema scarlatiniforme.
Erythema simplex.
Fissure of skin.
Folliculitis decalvans.
Herpes.
Hyperidrosis.
Ichthyosis.
Impetigo contagiosa.
Impetigo herpetiformis.
Impetigo simplex.
Ingrowing nail.
Intertrigo.
Keratodermia.
Keratosis.
Lentigo.
Leukodermia.
Leukokeratosis.
Lichen, planus.
Lichen, ruber.
Lupus, erythematosus.
Melanodermia.
Miliaria.
Milium.
Molluscum contagiosum.
Mycosis fungoides.
Nevus.
Onychauxis.
Onychia.
Onychoma.
Pemphigus.
Pityriasis rosea.
Pityriasis simplex.
Prurigo.
Pruritus.
Psoriasis.
Rhinoscleroma.
Rosacea.
Sclerodermia.
Seborrhoea.
Sudamina.
Ulcer of skin.
Urticaria.
Urticaria pigmentosa.
Wart.
Xanthoma.
Xerodermia pigmentosa.

Class XVI.—*Herniæ.*

Hernia, epigastric.
Hernia, femoral.
Hernia, inguinal.
Hernia, internal.
Hernia, ischiadic.
Hernia, ischiorectal.
Hernia, lumbar.
Hernia, obturator.
Hernia, umbilical.
Hernia, ventral.

Class XVII.—*Miscellaneous diseases and conditions.*

Acidosis, nondiabetic.
Adiposis dolorosa.
Ainhum.
Amputation, stump.
Amyloid disease.
Anti-inoculation, unqualified.
Beriberi.
Cicatricial contraction.
Cystinuria.
Dentition.
Diabetes insipidus.
Diabetes mellitus.
Diagnosis undetermined.
Erythromelalgia.
Gangrene.
Gigantism.
Glycosuria.
Gout, acute.
Gout, chronic.
Headache.
Hemochromatosis.
Hypertrophy of mammary gland.
Insomnia.
Lipemia.
Malformations, congenital.
Malingering.
Malnutrition.
Migraine.
Mikulicz's disease.
Milk sickness.
Nausea marina.
No disease.
Nostalgia.
Obesity.
Ochronosis.
Osteoarthropathy, hypertrophic.
Phantom tumor.
Raynaud's disease.
Rheumatism, chronic articular.
Rheumatism, muscular.
Rickets.
Scurvy.
Senility.
Shock.
Sinus.
Tetany.
Vertigo.

Class XVIII.—*Parasites (fungi and certain animal parasites).*

Abscess, entamebic, liver.
Abscess, entamebic, unqualified.
Actinomycosis.
Ascariasis.
Aspergillosis.
Blastomycosis.
Coccidiosis.
Cysticercus of brain.
Cysticercus of liver.
Cysticercus of lung.
Cysticercus, unqualified.
Dioctophyme renale.
Discomycosis.
Dracontiasis.
Dysentery, balantidic.
Dysentery, entamebic.
Echinococcus.
Erysipeloid.
Erythrasma.
Favus.
Flagellate diarrhea.
Larva migrans.
Metastrongylus apri.
Mucormycosis.
Mycetoma.
Myiasis.
Oxyuriasis.
Paragonimiasis.
Parameba hominis.
Pediculosis.
Piedra.
Pinta.
Pityriasis versicolor.
Sarcopsiliasis.
Scabies.
Schistosomiasis, intestinal.

CLASS XVIII.—*Parasites (fungi and certain animal parasites)*—Continued.

Schistosomiasis, urinary.
Sporotrichosis.
Strongyloides, intestinal.
Strongylus, Gibsoni.
Teniasis.
Thrush.
Trichiniasis.
Trichophytosis.
Trychostrongylus instabilis.
Trichuriasis.
Trichuris trichiura.
Trypanosomiasis.
Uncinariasis.

CLASS XIX.—*Tumors.*

Adenoma.
Angioma.
Carcinoma.
Chrondroma.
Cystoma.
Endothelioma.
Epithelioma.
Fibroma.
Filariasis.
Glioma.
Hypernephroma.
Lipoma.
Lymphangioma.
Lymphoma.
Mixed benign tumor.
Mixed malignant tumor.
Myoma.
Myxoma.
Neuroma.
Odontoma.
Osteoma.
Papilloma.
Retention cyst.
Sarcoma.
Teratoma.

CLASS XX.—*Injuries.*

Abrasion, unqualified.
Abrasions, multiple.
Air embolism.
Avulsion of limb.
Avulsion, unqualified.
Blood donor.
Burn.
Burns, multiple.
Castration, traumatic.
Compression of chest.
Compression of nerve.
Contusion.
Contusions, multiple.
Crush of lower limb.
Crush of upper limb.
Decapitation.
Deprivation of water.
Diagnosis undetermined.
Dislocation about ankle.
Dislocation about wrist.
Dislocation of clavicle.
Dislocation of elbow.
Dislocation of eyeball.
Dislocation of hip.
Dislocation of intra-articular cartilage of joint.
Dislocation of knee.
Dislocation of lens.
Dislocation of maxilla, inferior.
Dislocation of patella.
Dislocation of shoulder.
Dislocation of testicle.
Dislocation of vertebra.
Dislocation, unqualified.
Drowning.
Electric shock, injury from.
Emphysema, traumatic.
Epilation, traumatic.
Epiphyseal separation.
Exhaustion from overexertion and exposure.
Foreign body, traumatic.
Fracture about ankle joint, compound.
Fracture about ankle joint, simple.
Fracture about wrist joint, compound.
Fracture about wrist joint, simple.
Fracture of clavicle, compound.
Fracture of clavicle, simple.
Fracture of femur, compound.
Fracture of femur, simple.
Fracture of forearm, compound.
Fracture of forearm, simple.
Fracture of humerus, compound.
Fracture of humerus, simple.

CLASS XX.—*Injuries*—Continued.

Fracture of leg, compound.
Fracture of leg, simple.
Fracture of maxilla, inferior, compound.
Fracture of maxilla, inferior, simple.
Fracture of patella, compound.
Fracture of patella, simple.
Fracture of pelvis, compound.
Fracture of pelvis, simple.
Fracture of penis.
Fracture of rib, compound.
Fracture of rib, simple.
Fracture of skull, compound.
Fracture of skull, simple.
Fracture of vertebra, compound.
Fracture of vertebra, simple.
Fracture, unqualified, compound.
Fracture, unqualified, simple.
Frostbite.
Heat cramps.
Heat exhaustion.
Hematocele of tunica vaginalis.
Hematoma of penis.
Hematoma, traumatic.
Hemorrhage into eyeball.
Hemorrhage into joint, traumatic.
Hemorrhage under conjunctiva, traumatic.
Intracranial injury.
Intraspinal injury.
Lightning stroke.
Multiple injuries, extreme.
Powdered glass, injury from swallowing.
Rupture of globe.
Rupture of ligament.
Rupture of muscle.
Rupture of nerve.
Rupture of tympanum, traumatic.
Skin donor.
Smoke inhalation.
Sprain of joint.
Starvation.
Strain of muscle.
Strangulation.
Strangulation of penis.
Submersion.
Sunburn.
Sunstroke.
Synovitis, traumatic.
Thermic fever.
Torsion of spermatic cord, traumatic.
Urethral fever, traumatic.
Wound, gunshot, abdominal viscera.
Wound, gunshot, main artery or vein.
Wound, gunshot, brain.
Wound, gunshot, heart or pericardium.
Wound, gunshot, larynx.
Wound, gunshot, lower limb.
Wound, gunshot, lung.
Wound, gunshot, neck.
Wound, gunshot, pleura.
Wound, gunshot, spinal cord.
Wound, gunshot, upper limb.
Wound, gunshot, unqualified.
Wound, incised, abdominal viscera.
Wound, incised, main artery or vein.
Wound, incised, brain.
Wound, incised, heart or pericardium.
Wound, incised, larynx.
Wound, incised, lower limb.
Wound, incised, lung.
Wound, incised, neck.
Wound, incised, pleura.
Wound, incised, spinal cord.
Wound, incised, upper limb.
Wound, incised, unqualified.
Wound, lacerated, abdominal viscera.
Wound, lacerated, main artery or vein
Wound, lacerated, brain.
Wound, lacerated, heart or pericardium.
Wound, lacerated, larynx.
Wound, lacerated, lower limb.
Wound, lacerated, lung.
Wound, lacerated, neck.
Wound, lacerated, pleura.
Wound, lacerated, spinal cord.
Wound, lacerated, upper limb.
Wound, lacerated, unqualified.
Wound, punctured, abdominal viscera.
Wound, punctured, main artery or vein.
Wound, punctured, brain.
Wound, punctured, heart or pericardium.
Wound, punctured, larynx.
Wound, punctured, lower limb.
Wound, punctured, lung.
Wound, punctured, neck.
Wound, punctured, pleura.
Wound, punctured, spinal cord.
Wound, punctured, upper limb.
Wound, punctured, unqualified.

CLASS XXI.—*Poisons.*

Botulism.
Creatoxism.
Insect sting.
Lathyrism.
Poisoning by alcohol.
Poisoning by chloroform anesthesia.
Poisoning by ether anesthesia.
Poisoning by fish.
Poisoning by fish venom.
Poisoning by gasoline inhaled.
Poisoning by illuminating gas.
Poisoning by lead, acute.
Poisoning by lead, chronic.
Poisoning by mercury, acute.
Poisoning by mercury, chronic.
Poisoning by methyl alcohol.
Poisoning by methyl alcohol vapor.
Poisoning by milk.
Poisoning by nitrous oxide anesthesia.
Poisoning by opium, acute.
Poisoning by opium, chronic.
Poisoning by phenol.
Poisoning by potato.
Poisoning by serum.
Poisoning by snake venom.
Poisoning by tobacco, acute.
Poisoning by tobacco, chronic.
Poisoning by turpentine.
Poisoning by zinc.
Poisoning, unqualified.

ON THE METHODS EMPLOYED FOR THE DETECTION AND DETERMINATION OF DISTURBANCES IN THE SENSE OF EQUILIBRIUM OF FLYERS.

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The introduction into the Navy of a new service weapon, in the form of airships, has made a new type of physical examination for a special class of recruits necessary, if not absolutely imperative, namely, an efficiency test of the normal functions presiding over the maintenance of bodily equilibrium under a definite set of conditions. Existing disturbances of such functions in persons may, under ordinary circumstances, remain latent. In airships, especially in an operator enmeshed in the working machinery of such ships, such latent physical imperfections may become the causes of fatal accidents, because special requirements are here placed upon the individual sense for equilibrium and motion. Fortunately, our knowledge of this subject and of the methods of examining into the nature and character of these functions has in recent years been perfected in such a manner as to enable us to determine the exact condition of this sense in individuals with a degree of accuracy that was impossible 10 years ago. It therefore follows that the careful testing of this function ought to be made one of the requirements put upon all candidates for aeronautic honors in order to prevent fatal accidents due to this cause and, in a service that is already overburdened with so many possibilities of all sorts of dangers and accidents, due to other nonpreventable causes. The profession in general, but all naval medical officers in particular, owe a debt of gratitude to Dr. Huss for having been the first to give us a succinct summary of our

knowledge on the subject and to elaborate a method or system f[or] the examination of flyers in the above sense.

A.—THE BODY EQUILIBRIUM.

In the effort of maintaining the equilibrium of the body centri[f]ugal and centripetal stimuli take part. The centrifugal stimu[li] start from consciousness and pass to the motor area of the cereb[ral] cortex (disturbances through psychoses, hysteria, neurasthenia) thence to the pyramidal tracts, anterior horns, nerves, and muscle[s] (disturbances through diseases in the area of these tracts, muscles, joints, bones). Centripetal stimuli for the maintenance of equili[b]rium pass (1) from the entire periphery (muscles, joints, sk[in]) through the posterior columns of the cord to the brain and lit[tle] brain (disturbances in tabes dorsalis); (2) from the eye throu[gh] the optic nerve (disturbances in cases of paralysis of the eye muscles) (3) from the labyrinth through the vestibular branch to the bra[in] and cerebellum (disturbances in Ménière's symptom complex). [In] case one of the three groups of centripetal stimuli is absent, equili[b]rium may be maintained by the remaining two. The totally bli[nd] move along tolerably well; deaf-mutes, with bilateral destruc[tion] of their labyrinths, under normal conditions, show no disturbance in equilibrium; the tabetic, with perfect vision and labyrinth, ca[n] maintain himself in equilibrium, providing he keeps his eyes op[en]. When, however, in such cases of merely latent trouble, a furth[er] group of centripetal stimuli falls out, we get definitely visible sign[s] of disturbances. The tabetic falls down in the dark; the labyrinth-less deaf-mute, with eyes closed, begins to sway from side to si[de] and, under water, loses every trace of the faculty of orientation.

From these physiological facts we may derive the following important hints for the determination of the condition of bod[y] equilibrium: Disturbances in the centrifugal tracts may be detect[ed] without difficulty through the execution of movements. The detec[-]tion of disturbances due to lesions in the centripetal tracts is muc[h] more complicated and involves much greater difficulties, for th[e] reason that here one group of stimuli may vicariously assume an[d] perform the function of another. The simplest way to attain th[e] desired result of our examination would undoubtedly be to examin[e] each single group by itself, while eliminating the other two. This, however, is possible only for the eye. The labyrinth may be exam[-]ined separately; it can not be eliminated. With regard to the thir[d] group, which hereafter will always be referred to as "muscle sense," we are obliged to take into our examination labyrinth and centrifug[al] tracts at the same time. It will, however, be seen later that a per[-]fectly safe test for all the functions that are active in the maintenance of equilibrium is possible.

B.—THE SEVERAL FUNCTIONS OF EQUILIBRIUM AND THEIR EXAMINATION.

I.—The Eye as an Organ of Equilibrium and Its Examination.

On the part played by the eye, the principal organ of orientation, in the maintenance of equilibrium, a few words will suffice. It suffices to point out the disturbances in equilibrium due to double vision and vertigo during manifestations of nystagmus (see below). The examination of the eyes must, therefore, not remain limited to visual acuteness and the absence of disease. The action of the eye muscles (equilibrium, double pictures) and stereoscopic vision must be examined into.

II—The Labyrinth (Vestibular Apparatus) as an Organ of Equilibrium and Its Examination.

The examination of the functions of the labyrinth must be done with great care and circumspection, especially since a series of important facts were brought out in recent years through the researches of Barany. Our knowledge on the subject may be summarized in the following: The vestibular part of the labyrinth (canals and vestibule) represents an organ of equilibrium, the three planes of the canals effecting the perception of the changes of angular acceleration in all possible directions, while the utriculus serves the purpose of static equilibrium; that is, the perception of rectilinear acceleration.[1]

The stimulation of the nerve end organs in the ampullæ of the semicircular canals is effected through the lymph currents in these canals. Such stimulation finds outward expression:

1. In reflex movements of the eyes (nystagmus.).
2. In reaction movements of the extremities and of the body.
3. In turning sensations (vertigo).
4. In nausea and vomiting.

Symptoms 3 and 4 are not always present and, perhaps, are in part caused by the condition of nystagmus. The most significant signs for our purposes are nystagmus and, eventually, the different kinds of reaction movements.

The vestibular or semicircular canal nystagmus is easily differentiated from the optical nystagmus occurring in connection with certain eye diseases. In optical nystagmus the currents in both directions are equally rapid (undulating), while vestibular nystagmus is made up of a rapid movement toward one and a slow movement toward the

[1] Stimuli originate only in changes of motion. Uniform currents, in a straight line or in curves, are, for this reason, perceived only at the beginning, cessation, or on sudden changes in velocity. Thus, for instance, it is impossible to indicate the direction in which a railroad train moves at a uniform rate with eyes closed. This fact is of the greatest significance for the flyer. If a flyer, in addition to this normal want in sense of equilibrium, should lack, in consequence of vestibular trouble, the accurate perception for changes in direction and in velocity, he would, for instance, be utterly helpless in a fog. A sudden rise into great heights, besides, might result in a certain stimulus to the labyrinth.

opposite side (rhythmical nystagmus). This same form occurs normally in many persons, on the extreme lateral turning of the head and eyes, as well as pathologically, in cases of paresis of the eye muscles and of vision, when an attempt is made to move the eye as far as possible in the direction of the paralysis, and in intracranial diseases.

Vestibular nystagmus, as already mentioned, is made up of two components, a rapid one and a slow one, each moving in opposite directions. This form of nystagmus is intensified whenever vision is in the direction of the most rapid movement; it is weakened or altogether suspended when looking in the opposite direction. The movement may be either rectilinear (nystagmus horizontalis, verticalis, diagonalis) or curvilinear (nystagmus rotatorius) or both movements may coexist. The direction in which (on the part of the subject under examination) the more rapid component moves gives the nystagmus its character; during rotations it is toward the side in which the upper vertical iris-radius carries out the more rapid movement.

In recording the results of an examination, a straight arrow → is used to signify rectilinear nystagmus; a curved arrow ↷ rotary nystagmus. We write:

→ r. = nystagmus horizontalis, right.

↖ l. = nystagmus diagonalis, left and upward.

↑ = nystagmus verticalis, upward.

↷ l. = nystagmus rotatorius, left.

↷ → r. = nystagmus rotatorius-horizontalis, right.

The nystagmus receives its signification according to its direction in relation to the head of the subject. If, for example, the head during an examination is turned 90° upon the shoulder, a nystagmus occurring in the line between forehead and cheek is recorded as vertical, not as horizontal.

(a) THE EXAMINATION OF THE VESTIBULAR APPARATUS THROUGH NYSTAGMUS.

If our efforts at causing or creating a lymph current in the semicircular canals are successful and the created current is strong enough to act as a stimulus, we will be able to pass judgment on the functional capacity of the organ by either the appearance or the non-appearance of nystagmus. It being known, moreover, that the slow nystagmus component corresponds in direction to that of the lymph stream, a separate examination of the several canals becomes at least

›ssibility under certain conditions. In order to create the required ıph current, several different means are available:

. Turning of the body (turn or rotary nystagmus).
!. Partial cooling or warming the walls of the canals (caloric ›stagmus).
}. Air compression or rarefication and direct pressure upon the mbranous labyrinth (compression nystagmus).
ŀ. The passage of a galvanic current (galvanic nystagmus).

ſ. *Rotary nystagmus.*—Whenever the head is turned the lymph in ↄ arched canals will, in accordance with the law of inertia, lag hind, and a dislocation of the lymph will occur in the organ. This ›turbance ought to create a stimulus in the vestibular mechanism ıich should find expression in a rhythmical nystagmus. This is, leed, what happens, and will be illustrated by a concrete example. person under examination, with head erect, turns to the right ound the vertical axis (in the sense of the hands of the clock); this rformance starts a lymph dislocation in the horizontal canal in the ›posite sense (left); the ensuing nystagmus is horizontal, and, since e slower component part corresponds in direction to that of the mph current, the direction of the more rapid component must be the right. We have, therefore, in this case horizontal nystagmus the right. After a while the turning movement involves the lymph ›elf, and if we now interrupt the rotation of the head the lymph, in ›cordance with the same law of inertia, will continue to move in ıe same direction and we get a left nystagmus. If the head during ıe turning movement is inclined 90° in the direction of the right ıoulder, we get a vertical nystagmus upward (posterior vertical ›micircular canal), and if inclined 90° in a forward direction (anterior ertical canal) we get rotary nystagmus to the right, because the ıief lymph movement takes place in the vertical canals. Interme-iate positions of the head give rise to combinations of the different ›rms of nystagmus described.[1]

In order to enable the examiner himself to observe a rotary nystag-ıus, a rotation platform would be required, with standing room for oth the observer and the observed. In the ordinary examinations ; is therefore found more convenient to observe the after nystagmus, ›hich in its movement resembles the original, but is in the opposite irection. When in the following, therefore, rotary nystagmus is poken of, it always means after nystagmus. Its duration gives us

[1] Other symptoms accompanying the rotation test are, according to Barany, the following: (1) Pseudo-›tations of external objects; (2) sense of falling; (3) reaction movements; (4) darkening of the visual eld; (5) nausea, even vomiting; (6) pallor, perspiration, slowing of pulse, trembling, a quickening and eepening of respiration; (7) more or less serious interference with consciousness. All these symptoms, ›ith the exception of those under (3) are so inconstant that a mere mention must here suffice. It is to be oted, however, that the manifestations spoken of under (5) and (7) might point to a condition of hyper-xcitability on the part of the organ or to the existence of a neurosis.

the definite measure of the strength of the stimulus in the organ. Barany has found that the duration increases in direct proportion to the number of rotations, reaches its maximum with 10 turns, and then decreases again. With 10 turns in 20–22 seconds the duration is 40 seconds, but wide variations above and below this average will occur.[1]

While noting, then, during our examination, the duration of the nystagmus produced, the principal other consideration will be the presence or absence of the nystagmus itself.

The examination: The subject being seated on the revolving chair, we must first ascertain whether extreme lateral sight results in spontaneous nystagmus, and note the angle at which it begins to show itself. This limit is not to be transgressed later when recording the results of the direction of the sight. (This applies to all other tests for nystagmus.) Inasmuch as the nystagmus is influenced through fixation, a pair of opaque glasses is placed before the eyes at such a distance from the eyes, however, as to enable the examiner to observe the eyes. The person, seated in the chair with head erect, is now subjected to 10 turns in about 20 seconds; at the end of this period the eyes of the person, now looking in a direction of about 50° to the left, are observed until the nystagmus disappears. The result is recorded as follows: ——→ *l*. 40 seconds. The same is done with rotation to the left. It is to be noted that the nystagmus need not necessarily always be purely horizontal, since the semicircular canal concerned may deviate from the horizontal plane more or less, in accordance with the position of the head.

2. *Caloric nystagmus.*—To get a caloric nystagmus we must start a lymph current by the application of heat or cold to a circumscribed portion of the wall of the canal. This may be done by rinsing the ear with either warm or cold water. The temperature difference reaches the adjoining endolymph, changes its specific gravity, thereby causing a current producing the nystagmus. This method of exciting a current has this advantage over rotation, that it permits the separate examination of both labyrinths.

In order to establish a current through changes in temperature within a ring-shaped cavity filled with fluid by which we may represent a semicircular canal, it is of importance to keep in mind the position of this ring in space.

If we imagine the ring lying horizontally on a table (fig. 1, *a*), the lowering of the temperature of a point in the periphery of it will not be followed by a circulation of its contents (pessimum position). If we raise the ring so that it remains in contact with its underlying horizontal support only at a certain point (fig. 1, *b*), then the partial

[1] The results sometimes vary in the same person under right and left rotation. A constant shortening of left nystagmus as compared to right nystagmus was noted in dancers who turn invariably to the right in dancing.

cooling starts a current and its velocity will increase in proportion as the position of the ring approaches the vertical (optimum position, fig. 1, *c*). Moreover, in the case of this vertical position of the ring, it is by no means indifferent at which point the temperature is

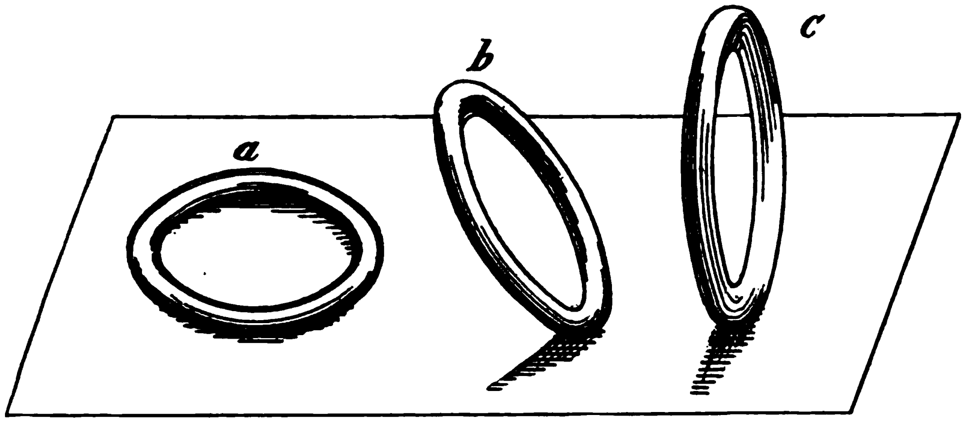

Fig. 1

lowered. If this should be attempted at the lowermost point (fig. 2, *a*), where it is in contact with the table, the result will be no circulation, because the temperature changes thus produced will be equal in both halves of the ring; the same is true for the opposite pole (fig. 2, *b*). The cooling agent must therefore be applied be-

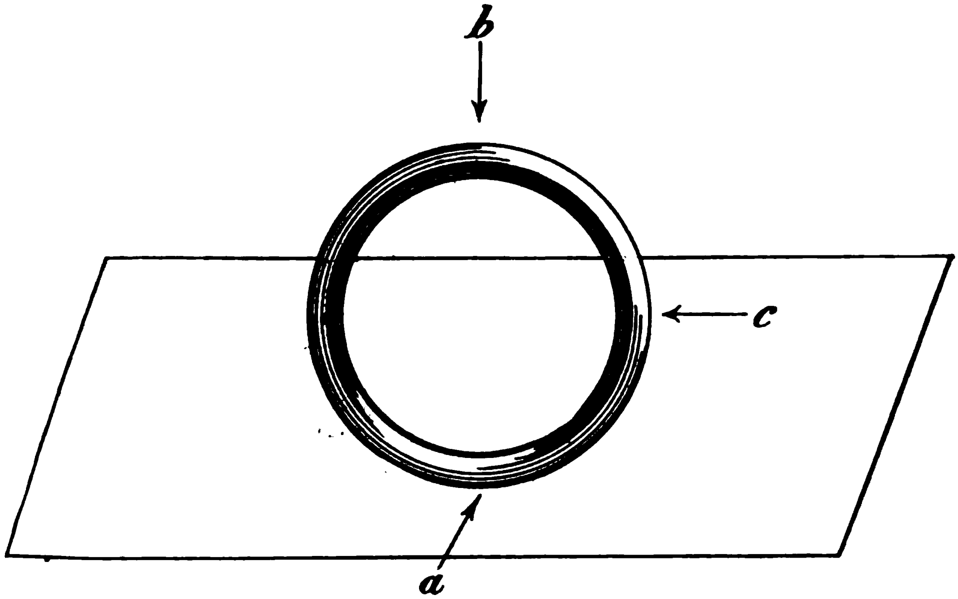

Fig. 2

tween those two points. (Fig. 2, *c*.) If we further assume the ring to be so placed that the cooling process can be applied only to an isolated point in its periphery, we obtain a second optimum position by such a turn of the ring as will place this point in a position some-

where between the highest and the lowest. This, in the case of the semicircular canals of man, may be effected through appropriate positions of the head.

With the aid of the above-mentioned illustrations we can explain the facts observed and elicited through the caloric test. The most favorably situated horizontal semicircular canal forms with the horizontal plane in the erect position of the head, an angle of about 30°, open in front; in other words, its position is one between optimum and pessimum. If we now begin to rinse the right ear with cold water, the endolymph begins to circulate in the direction of the hands of the clock; the slower component of the ensuing horizontal nystagmus will therefore be directed to the right; that is, the nystagmus produced will appear as horizontal nystagmus to the left. If we use water of a temperature above that of the body, we obtain nystagmus to the right. If we now place the head in a position 60° backward, the canal is in its optimum position and the nystagmus will make its appearance with a smaller quantity of rinsing fluid. Inclining the head forward, after the appearance of this nystagmus, about 30° beyond the erect position of the head—that is, placing the canal in pessimum position—our nystagmus will either disappear altogether or become less pronounced. Returning the head to the optimum position will cause the nystagmus to reappear. Beginning with rinsing the ear in the pessimum position, we obtain no nystagmus or only a slight amount and after long continued rinsing; the, nystagmus, however, appears at once if the head after such rinsing is bent backward 60°. In addition to this primary optimum position, we may obtain another by further bending the head, already inclined 60° backward, 45° in the direction of the shoulder of the same side as that on which the rinsing was done. In this position the nystagmus appears earlier than in the first optimum position. If we, on the other hand, incline the head, already bent backward 60°, in the direction opposite to that on which the rinsing took place, the horizontal nystagmus will disappear wholly or in part and we notice stray rotary spasms, pointing to the fact that the anterior vertical canal has assumed a position favorable to the influences of excitation. (Vertical nystagmus, that is, the excitation of the posterior vertical canal by the caloric method has up to the present not been equally successful.)

The valuation of the results of the examinations: Brünings noted the amount of water that was necessary for the production of caloric nystagmus in the different head positions, using it as a quantitative measure for estimating the degree of excitability. As mean values were found:

t an inclination of the horizontal canal	90°	60°	30°	0°
Required quantity of water (27°) c. cm.	60	75–80	120	00

Considerable deviations from these mean values occurred in otherwise perfectly normal subjects. Alterations in the normal channels through which the temperature is communicated, may result in producing differences. Perforations of the tympanum will accelerate, while acute inflammations of the middle ear, granulations, or stoppage of the external ear passage will retard or entirely prevent the appearance of nystagmus.

Routine of the examination: After the usual preliminary examination of the ear (perforations, inflammations, cerumen, narrowing of meatus) we ascertain, to begin with, whether spontaneous nystagmus exists or not, especially whether it may be produced by looking sideways about 50°. The head is now fixed, with the subject sitting

Fig.3

Fig.4

in a bent backward position of 60° (fig. 3) and looking sideways 50°. The rinsing is done with water of a temperature of 27°. On the appearance of nystagmus (direct observation; certain preliminary single spasms may precede the full appearance of it) the rinsing is interrupted. Before proceeding with the examination the head is inclined forward about 30° (fig. 4) in order to find out whether the nystagmus disappears or becomes less pronounced. If no nystagmus be obtained, the temperature of the water may be lowered to 20° and the head, in addition, be brought into the second optimum position (60° backward and 45° toward the shoulder). (Figs. 5 and 6.) If this should likewise prove negative, we now test the irritability of the vertical canal (head 60° backward and 45° toward the shoulder

of the side opposite to that on which the rinsing was done). (Figs. 5 and 6.) The realization of a rotary nystagmus thus induced is much more difficult than that of the horizontal form, on account of the smallness of the excursions. It is best to keep under observation a vessel on the sclerotic in the middle of the lid opening. Only after this last attempt has proved a failure are we permitted to record the results of the caloric test as negative.

Brünings has constructed an otocalorimeter which permits a measured quantity of water of a definite temperature to pass in and out of the ear passages. The quantity utilized up to the moment of the appearance of nystagmus is noted in c. c., and Brünings signifies an excitability aroused with 70 c. c. of water as $=1$, with 90 c. c. as $=\frac{3}{4}$, with 50 c. c. as $=1\frac{1}{2}$. For the uniform head positions and directions of sight he uses his otogoniometer.

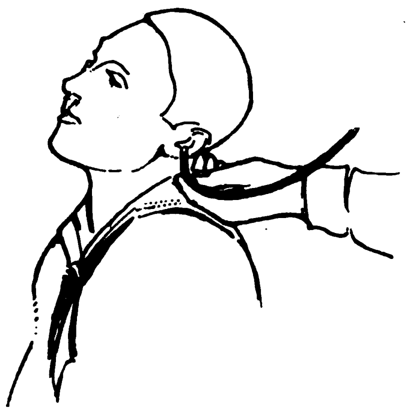

Fig. 5

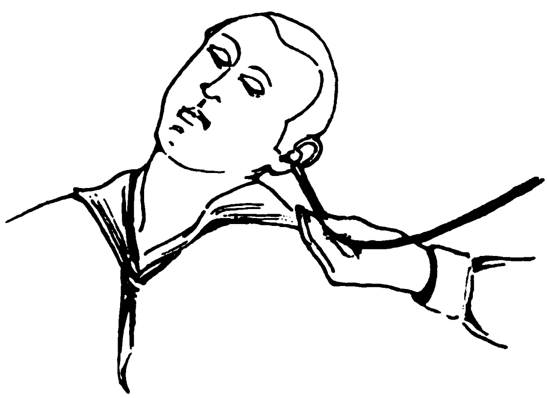

Fig. 6.

3. *Nystagmus by compression.*—Assuming that the bony wall of the labyrinth is at some place defective so as to admit an effective pressure at some point of its course, it becomes at once conceivable that the application of such pressure will excite a current in the fluid contents of the labyrinth and produce nystagmus. That this, indeed, is the case was shown by Ewald in his experiments on pigeons. The same observation can be made when, after laying open a cavity of the middle ear—an accidental bony fistula in the canal existing—pressure by means of a sound is made over such a lesion. Such a bony deficiency not being open to inspection in a normal ear, the pressure may be produced by condensation of the air in the cavity of the tympanum. This method also enables the operator to cause a reversal of the current in the labyrinth through subsequent rarification and thus to give the original nystagmus an opposite direction.

The form of the eye reaction produced in this manner does not show the same uniformity with regard to direction and velocity as is shown in caloric and rotary nystagmus. We will notice slow movements of the eyes or a more energetic nystagmus in a horizontal and vertical direction. The question whether and in how far such a fistula may be localized by a consideration of the different forms of nystagmus produced in this way has not yet been decided. The symptom has long since been utilized clinically for the determination of the existence of defects in the canals. The same symptom was later found to exist also in canals without defect; namely, in cases of syphilitic disease of the labyrinth; also after the separation of the connection between hammer and anvil. The diagnostic value of the examination, though very considerably impaired, is nevertheless not wholly without significance when taken in conjunction with the results of other tests.

Routine of examination: The olive-shaped body of a Politzer's balloon is introduced air-tight into the external auditory meatus. The eye of the observer is placed close to that of the subject, who is made to look straight ahead, and now the air within is alternately condensed and rarefied by working the balloon.

4. *Galvanic nystagmus.*—While the forms of nystagmus so far considered were easily explained as being caused by endolymph currents excited in the vestibular apparatus in different ways, in galvanic nystagmus we are obliged to take refuge in the hypothesis which merely assumes the existence of an electrical current similar to that in the endolymph of a "cataphoresis."

Galvanic nystagmus appears when a constant electrical current is passed through the labyrinth. It is rotatory and directed toward the side under examination when the cathode (outgoing stream) is applied to the labyrinths; it takes the opposite direction when the anode (ingoing current) is thus applied. But since such a nystagmus may be produced under certain circumstances in a destroyed labyrinth (according to Brünings, in the presence of a still functional remnant of the nerve end organ) the reaction, for our purpose—namely, that of establishing the existence of a normal labyrinth—has no value.

The routine of the examination may, for the sake of completeness, be described briefly: The examiner holds the cathode in his right hand, and the anode is pressed against the right ear (planum). A gradually increasing current of 10–20 milliamperes sent through the closed circuit will give rise to a rotatory nystagmus to the left; the reverse current produces a rotatory nystagmus to the right. Anode and cathode being applied simultaneously to either the right or left ear (testing both vestibular mechanisms at once), the nystagmus appears with 2–4 milliamperes. Soon after the first appearance of the nystagmus the current is rapidly decreased in order to avoid more

serious vertigo. When looking straight forward this vertigo comes on before the nystagmus; in order to avoid it the examinee is asked to look sideways as during the preceding tests; that is, toward that side on which the nystagmus may be expected to make its appearance.

5. *Spontaneous nystagmus.*—Since spontaneous nystagmus renders a person absolutely unfit for service in aviation, whether it is due to pathological conditions of the vestibular mechanism or to other intracranial lesions, a brief mention of it will here suffice. In examining for spontanoeus nystagmus the nystagmus occurring on extreme vision sidewards is, of course, likewise to be excluded. The examinee is at first directed to look straight ahead, then about 40° sideways. If nystagmus is present, it must become more pronounced when the subject looks in the direction of its more rapid component; it must become less pronounced or entirely disappear when he is looking in the opposite direction. Since, under forced fixation, eye movements may also occur, the examiner had better simply indicate, by a movement of his hand, what is about the direction in which the examinee is expected to look without efforts at fixation.

(b) THE EXAMINATION OF THE VESTIBULAR APPARATUS THROUGH REACTION MOVEMENTS.

Reaction movements, as an additional sign of labyrinthine excitation, beside nystagmus, have already been spoken of. They are called into being in the same manner as is nystagmus, through rotation or caloric excitation. The possible tests are many. Their application, especially the correct interpretation of the results obtained, requires an experienced examiner and great attention on the part of the examinee, so that our limitation to a few of the simplest methods is justified. The reaction movements may be divided into two classes or groups—those of the body as a whole, and those of the extremities.

Reaction movements of the body.—Having called into existence a horizontal nystagmus to the right and directed our subject to close his eyes, we will notice a reaction movement to the left (swaying, fall). If we turn the head around the vertical axis 90° to the right, the movement occurs in a forward direction; if we turn it 90° to the left, the movement is backward. The bodily movements take place in the plane into which the nystagmus turns, and their direction is opposite to that of the more rapid movement of the nystagmus.

Reaction movements of the extremities (indicator-finger tests).—If we direct a subject under a right nystagmus with eyes closed to touch a finger held in front of him, then to let go and again touch it, the subject will miss it, pointing to the left of the finger. The same applies, of course, with the corresponding change to a left nystagmus.

Routine of the examination.—The testing the body reactions presents no great difficulties. After having produced a nystagmus the subject assumes a position as in Romberg's test and looks, with eyes closed, in the direction of the more rapid component of nystagmus.

The indicator test, on the contrary, requires attention in various directions if it is to be successful. It will be of advantage to practice the maneuver involved in the test described below, first, with eyes open and without nystagmus. Having now produced a rather pronounced nystagmus, the person, being in the sitting position, is asked to close his eyes and look in direction of the existing nystagmus. Then the examiner guides the extended index finger of the examinee to his finger, held in front of the chest of the latter. The examinee is now directed to touch his leg, and after this is done to touch again the finger of the examiner, held in front of the chest of the subject. It is necessary to make sure that the eyes of the examinee remain closed, even after passing the finger of the examiner. The examinee must not know the real object of the test, in order to eliminate any possible effort of his will at correction. It is therefore advisable for the examiner to touch the finger of the examinee after the latter's missing it, in order that he shall not become conscious of his failing in the test.

(c) INCREASED EXCITABILITY OF THE VESTIBULAR MECHANISM.

The methods of examination described in the preceding, while enabling us to ascertain the existence of a functional deficiency in the vestibular mechanism do not permit us to infer, with the same precision, the existence of an abnormally increased irritability of the organ. This is because the quantitative results so far attained show, even in normal cases, considerable deviations from the mean values as ascertained by Barany and Brünings. Both these authors state that they have noted wide deviations on either side of the mean in several individuals with normal vestibular apparatus. All the same, an abnormally early appearance of a nystagmus and an unusually long duration of it must receive attention. The presence or absence of spontaneous nystagmus and the results of examinations of the muscle sense must be allowed to give further indications of value in the final decision.

III. THE MUSCLE SENSE AND THE CENTRIFUGAL TRACTS AND THEIR EXAMINATION.

In the examination of the third of the groups of centripetal stimuli, that of the muscle sense, an isolated test is impossible. We are able to eliminate neither the labyrinth nor the participation of the centrifugal tracts. It must nevertheless be conceded, on a little further thought, that valuable results may still be obtained by such examinations: The eyes may be eliminated at any time; the laby-

rinth has already been examined and its functional capacity ascertained. If now, we observe deviations from the normal, we have only to consider the muscle sense with the remaining centripetal tracts and centrifugal functions. Disturbances having been found to exist, further differentiation need make no great difficulties and may be altogether discarded for our purposes, because what we are trying to make sure of is the esistence of normal functions of the equilibrium under all conditions.

The principal or chief representative factor in all these experiments is the long-known test for Romberg's phenomenon. From this von Stein was able to derive and develop a whole system of tests during the last two decades, and which it would lead us too far to discuss here. Von Stein divides his examinations into examinations of the equilibrium at rest (static) and during movements (dynamic).

Static examinations.—In the static examinations we must differentiate between tests in the horizontal plane and those in the inclined plane.

The tests on the horizontal plane consist in (1) two-leg position, the entire sole of the foot touching the supporting surface; (2) two-leg position on toes; (3–4) one-leg position, right and left, each with eyes open and closed.

For the tests on the inclined plane von Stein has constructed what he calls goniometers. The principle of the apparatus consists in that the subject under examination stands on a board which can be made to form any desired angle with the horizontal plane. The angle at which the disturbance appears is noted. The test is so made that the subject once during an examination turns his face, back, right, and left side toward the point of section of the horizontal and inclined planes.

Dynamic examination.—The number of tests possible in the dynamic examination is legion. Even if we eliminate the dynamic examination of the upper extremities (for our purposes the preparation for the index finger indicator test is sufficient), the muscles of the neck, head, eyes, and body, von Stein for the lower extremities alone has perfected a scheme of 31 tests, each one with eyes closed and eyes open, therefore a total of 62. In the following list the odd numbers indicate the tests with open eyes, the even numbers those with eyes closed:

1, 2. Going forward on entire foot soles.
3, 4. Going backward on entire foot soles.
5, 6. Going forward on toes.
7, 8. Going backward on toes.
9, 10. Hopping forward on entire foot soles.
11, 12. Hopping backward on entire foot soles.
13, 14. Hopping forward on toes.
15, 16. Hopping backward on toes.

17, 18. Hopping forward on right foot on entire foot sole.
19, 20. Hopping backward on right foot on entire foot sole.
21, 22. Hopping forward on left foot on entire foot sole.
23, 24. Hopping backward on left foot on entire foot sole.
25, 26. Hopping right sideward on entire foot sole, legs closed.
27, 28. Hopping left sideward on entire foot sole, legs closed.
29, 30. Hopping right sideward on toes.
31, 32. Hopping left sideward on toes.
33, 34. Hopping right sideward on toes of right foot.
35, 36. Hopping left sideward on toes of left foot.
37, 38. Hopping forward on toes of right foot.
39, 40. Hopping backward on toes of right foot.
41, 42. Hopping forward on toes of left foot.
43, 44. Hopping backward on toes of left foot.
45, 46. Upward jump in loco on both legs.
47, 48. Upward jump in loco on right leg.
49, 50. Upward jump in loco on left leg.
51, 52. Turning to the right, with legs closed, hopping four times.
53, 54. Turning to the left, with legs closed, hopping four times.
55, 56. Turning to the right, on right leg, on entire foot sole, hopping four times.
57, 58. Turning to the left, on right leg, on entire foot sole, hopping four times.
59, 60. Turning to the left, on left leg, on entire foot sole, hopping four times.
61, 62. Turning to the right, on left leg, on entire foot sole, hopping four times.

For our purpose it will suffice to make the tests 1, 2, 4, 12, 20, and 24. If these, but especially 20 and 24, turn out satisfactory, all other tests become superfluous.

It may here be mentioned once again that any disturbances that may be elicited by the above tests need not necessarily be due to lesions in the centripetal tracts. We may also have centrifugal lesions, and these may be located all the way in and from the cerebral cortex (hysteria neurosis) to the peripheral muscles (paralysis). Such cases are unfit for the aviation service.

ROUTINE OF THE EXAMINATION.

Static test—(*a*) *On the horizontal plane.*—The subject stands, knees pressed backward, arms hanging loosely by the sides of the body, inner margins of feet touching each other, eyes open.

Two-leg position (for an indefinite time without swaying).

Toe position is assumed from the preceding position (may be maintained for a minute or longer).

One-leg position, right, then left (may normally be maintained ¼–½ a minute; an occasional attempt at balance or slipping forward is of no significance). The sole of the elevated foot may touch either the knee or the dorsum of the other foot. The above tests are now repeated with eyes closed.

(*b*) *On the inclined plane.*—The test may be made with or without socks. The board of the goniometer is coated with resin or powdered magnesia. First ascertain whether the mobility at the ankle joint

is normal; the horizontal position of the board is now gradually and smoothly inclined until swaying ensues. Arms continue in the hanging position; knees remain as before, pressed backward; no bending of body on lower extremities is to be allowed. The subject stands alternately (1) with face toward the point of section of the two planes (high in rear) 35–40°; (2) with back toward top of angle (high in front) 26–30°; (3) and (4) with one side toward top of angle (right high, left high) 36–38°.

The tests with eyes closed must approximate the same angle.

Dynamic test.—The test is likewise made with feet bare. For safety's sake a man is stationed on the point to be reached; another man accompanies him during his movements. Disturbances in equilibrium declare themselves, first, in wide differences between the tests with open and closed eyes. A slight degree of uncertainty and deviation with eyes closed is allowable, but a persistently wide deviation to one side or the absolute inability to stand the test, e. g., of Nos. 20 and 24, are not admissible.

The footprints may be fixed permanently. The subject is made to stand, first, on a mat of felt covered with a mixture of soot and petroleum. He then is made to perform the movements on strips of paper 8–10 meters long and 1½ meters broad. The tracing of his gait (ichnogram) thus obtained may, by photographic processes, be reduced to any desired form and size.

C.—ROUTINE TO BE FOLLOWED IN EXAMINATIONS MADE FOR THE PURPOSE OF ESTABLISHING THE CAPACITIES FOR MAINTAINING BODILY EQUILIBRIUM, UNDER A DEFINITE SET OF CONDITIONS, IN INDIVIDUALS DESIRING ADMISSION TO THE AERONAUTIC SERVICE AND THE VALUATION OF THE RESULTS OBTAINED.[1]

It will be admitted that in examinations for fitness in the aeronautic service, based upon the point of view developed in the preceding pages, it becomes necessary for the examiners to follow a uniform plan, not only in the examinations themselves, but also in the recording and valuation of the results obtained. The author therefore has proposed the following routine of examination with an adjoining formulary, in which the results are to be entered:[2]

I.—Examination of the Eyes.

The anamnesis, or previous history (1a in table), must be more especially studied with reference to existence of scotoma, weakness in accommodation, asthenopic conditions, double vision. In the

[1] The following routine of examination is intended to be applied more especially to aviators. For the service in airships the requirements may be made less rigid.

[2] In the following the numbers inclosed in () parentheses refer to the columns in the formulary. In this the results of the examinations have been entered for further illustration. The tests marked with a (+) sign (8, 18, 21) are made only when the tests 5–7 or 19 give unsatisfactory results.

objective examination (1b) all deviations from the normal are to be noted. Recent inflammations of the deeper structures, as traces of extensive former troubles (retinal or choroid lesions, adhesions of the iris) render unfit.

The refraction (2) should be uniform for both eyes; hyperopia, over three diopters, is inadmissible. Visual acuteness (3) must be at least 6/6 for both eyes; the visual field is inquired into only cursorily with the hand; only in the case of changes in the deeper structures or on hints elicited in the previous history of the person need the perimeter be employed. The pupillary reaction (4) is to be tested (a) directly, (b) consensual, (c) for accommodation.

In the examination of the functional capacity of the eye muscles the more easily detected disturbances, such as may be elicited by passing a finger in front of the person's eye and which the subject is asked to follow, are to be noted.

Muscular equilibrium (6) is tested under cover with the hand, and then by means of the maddorod (maddostab). Deviations over 2 of the scale (4 m. distance) are inadmissible.

Stereoscopic vision (7) is tested by means of a Zeiss stereoscope and a Helmholtz rod apparatus. The test is positive when on the latter apparatus, after the second or third question, no more errors are made; on the former apparatus, differences at 4 m. distance between 2–3 lines of the scale must be seen.

Tests for double vision are made only when the results Nos. 1a and 5–7 do not correspond.

II.—Examination of the Ear.

(*a*) *Auditory organ.*—The previous history has to note former diseases, permanent or temporary difficulty in hearing, ringing in the ears.

The objective examination (9b) has reference to the auditory meatus and tympanum.

Foreign bodies (cerumen) or narrowing may have an influence on the test (18).

Pus in the middle ear or dry perforations are inadmissible. Firm old cicatrices are admissible. Stray contractions render unfit, whenever they are accompanied by impermeability of the eustachean tube and a notable degree of loss of acuteness of hearing.[1] In case that the cause should be discovered to lie in an impediment to free respiration in nose or throat, this is to be removed.

The ability to hear whispered words (10) is noted by adding to the hearing distance the length of the room in which the examination is

[1] Such a condition of catarrh is cause for delayed equalization of pressure differences in the middle ear during a rapid rise or fall, and may give rise not only to great disturbances in hearing, but also to hemorrhages into the tympanum and to vertigo.

made. In the estimation of the result (whisper = 6 m.) it is of im-portance to know whether the examining room has a length of 6 m (whisper = 6 (6) m.) or whether it is 9 m. (whisper = 6 (9) m.).

The results of the test for bone conduction (12) and for the upper and lower sound limits (14, 15) are to be correctly appreciated only in combination with the results obtained in 9 and 10. Advanced scleroses exclude. Inturnings without considerable disturbances in hearing and due to firing do not render unfit.

(*b*) *The organ of equilibrium.*—The anamnesis must make search for attacks of vertigo, disturbances of equilibrium, mountain sickness, vertigo at great heights, seasickness.

Since it became known and a matter of common experience that persons who were subject to vertigo at certain heights failed to experience this sensation in airships and aeroplanes, a preliminary trial trip, as passenger, should be undertaken by such persons before reaching a decision as to their fitness for the service. Seasickness excludes if it persists, even after a longer service on board. But even in such cases a trial flight might be indicated.

Spontaneous nystagmus (17) must appear only on extreme lateral sight (a). Rhythmical nystagmus on an easy turn to right or left of about 40° or looking straight ahead (b) renders unfit.

A test for rotary nystagmus need be made only when the caloric test (19) gives an uncertain or negative result. The duration and direction of the rotation with head in the erect position is noted. The test is positive when nystagmus appears on rotation to both right and left.

For caloric nystagmus (19) we employ cold water, beginning with 27°, following this, in case the result was negative, with water of 20°. We examine, to begin with, with the head bent backward 60° (a) (I. optimum position); if nystagmus appears, we now bend (b) (pessimum position) the head 90° forward—that is, 30° beyond the vertical head position—and take note of whether the nystagmus disappears altogether, grows less pronounced, or else assumes a more rotary form. All three changes suffice, even if the changes are not considerable. In case no nystagmus is observed, we now place the head in the (II. optimum position) (c), that is, bending it 60° backward and 45° toward the shoulder of the side on which the rinsing was done, and note whether nystagmus appears. The examination is made with both ears; before examining the other side we must wait until the nystagmus of the first side has disappeared. The direction, not the duration, of the nystagmus is now recorded; eventually, also, the quantity and temperature of the water needed to produce it. The production of nystagmus on both sides is sufficient (without regard to the number found).

The pressure nystagmus (20) renders unfit.

NAME..................

I.—EYE.

(a) Anamnesis. (b) Objective eye examination.	Refraction.	(a) Acuteness of vision and (b) Visual field.	Pupil reaction.	EY Mobility.	equ
1	2	3	4	5	
(a) As a child had frequent inflammations of eye. (b) Right slight cicatrix on margin of cornea otherwise normal.	r. = ± 0 l. = ± 0	(a) r. = 6/6 glasses impair vision. l. = 6/6 glasses diminish vision. (b) Visual field normal.	(a) Normal. (b) Normal. (c) Normal.	Normal.	No

STATICS.

Horizontal plane.						Inclined			
2-leg position.		Toe position.		1-leg position.		Rear high.		Front high	
E. O.	E. cl.	E. O.	E. cl.	E. O.	E. cl.	E. O.	E. cl.	E. O.	E
23	24	25	26	27	28	29	30	31	
Firm.		Firm.		Firm.		38°	36°	30°	

22553—14. (To face page 104.)

Galvanic nystagmus (21) may be tested, providing the proper apparatus is available. In general, this test is omitted, on account of the results being of no value for our purposes.

Finger-indicator reaction (22) must (a) be carried out, in case of absence of nystagmus with eyes closed and without the finger missing its object. If (b) the reaction, after the appearance of nystagmus, remains absent, it is of no consequence when test 19 and the following muscle-sense tests turn out satisfactorily, for the reason that the reaction has not the same objective value as has test 19.

Signs indicating increased irritability, showing themselves during the examination, should be noted; their value depends on the combined results of the whole examination.

III. Examination of the Muscle Sense.

Static tests.—During the examinations in the horizontal plane the positions 23 and 24 (e. o. = eyes open; e. cl. = eyes closed) must be maintained without swaying for a liberal period; 25 and 26, at least one minute.

During the examinations on the inclined plane (29–36) (goniometer) the tests are to be repeated in case the results are unsatisfactory. For the sake of brevity, all further tests with eyes open may be omitted after test 30.

In the dynamic examination (37–42) it is expected that a notable deviation from the straight line will not occur; the difficult tests, 20 and 24, are to be repeated several times if necessary.

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U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the pathological collection, United States Naval Medical School, October–December, 1913.

Accession No.	Tissue.	Diagnosis.	Collected by or received from—
1046	Liver	Schistosomum japonicum	Dr. R. H. Laning, U. S. S. Saratoga.
1047		Molluscum contagiosum	Dr. E. R. Stitt, Naval Medical School.
1048	Tissue from jaw	Epithelioma	Dr. R. Spear, naval hospital, Washington, D. C.
1051	Blood	Estivo-autumnal	Dr. H. F. Strine, naval hospital, Norfolk, Va.
1052	Meckel's diverticulum.	Acute miliary tuberculosis	Dr. M. F. Gates, naval hospital, Mare Island, Cal.
1053	Colon	Dysentery	Do.
1056	Intestine	Hemorrhagic infarct	Dr. R. Spear, naval hospital, Washington, D. C.
1057	Blood	Tertian malaria	Naval hospital, Washington, D. C.
1059	Liver	Lymphatic leukemia	Dr. D. G. Allen, naval hospital, Newport, R. I.
1065	Blood	Estivo-autumnal	Dr. H. F. Strine, naval hospital, Norfolk, Va.

Additions to the helminthological collection, United States Naval Medical School, October–December, 1913.

Accession No.	Parasite.	Host.	Collected by or received from—
19885	Tænia saginata	Homo	Naval hospital, Washington, D. C.
19887	Cysticercus fasciolaris	Rat	Dr. F. W. F. Wieber, navy yard, Boston, Mass.
19888	Tænia saginata (head).	Homo	Naval hospital, Washington, D. C.

SUGGESTED DEVICES.

A PORTABLE AIR-SAMPLING APPARATUS FOR USE ABOARD SHIP.

By E. W. BROWN, passed assistant surgeon, United States Navy.

The apparatus here described and illustrated has been designed for the rapid collection in duplicate of relatively large volumes of air to be examined in the laboratory for such gases as carbon monoxide, hydrogen sulphide, oxides of nitrogen, etc. Minute percentages of those gases are of hygienic significance, and the standard methods of analysis require the aspiration of large quantities of air through appropriate absorbents. It is not practicable as a rule to make the analysis on the spot, particularly if the air is rapidly changing in composition, owing to the time required for aspiration and the special apparatus necessary to complete the analysis. A situation might arise, for example, in an engine room or after gun fire when it is desirable to take large samples speedily, so that a representative sample within a short time interval may be obtained. The present apparatus is designed to fulfill such requirements.

The apparatus is portable, protected against breakage under shipment, and air-tight. It consists of a wooden case, 17 inches long, 12 inches deep, and 14½ inches high, inclosing two glass bottles each of 2,000 c. c. capacity, with gas-tight stopcocks and fitted with a standard thermometer. The bottles are connected by glass and metal tubes with the inlet of a brass suction pump of special design. The writer has determined on the basis of a large number of tests that each stroke of the suction pump draws about 800 c. c. of air through the two bottles at the rate of about 1 stroke per second. This was observed by connecting the two lower stopcocks to a gas holder and exhausting a definite quantity of air from the latter through the bottles with the pump. The course of the air in sampling is as follows: Through stopcocks E_1 to bottles, through stopcocks E_2 to the reducing T tube G to H and to pump. The bottles rest on felt pads and are held firmly in place by copper straps incased in felt. The pump is readily accessible for interior inspection.

There is an outside carrying case provided for shipment, not shown in the sketch. This has a protective arrangement of springs at the bottom and also on the underside of the cover; the sides are covered with very heavy felt padding. The inside case is therefore guarded against sudden jar in handling and no packing material is needed.

Thorough tests for tightness were made. There may, of course, be marked changes in pressure of the contained sample as a result of

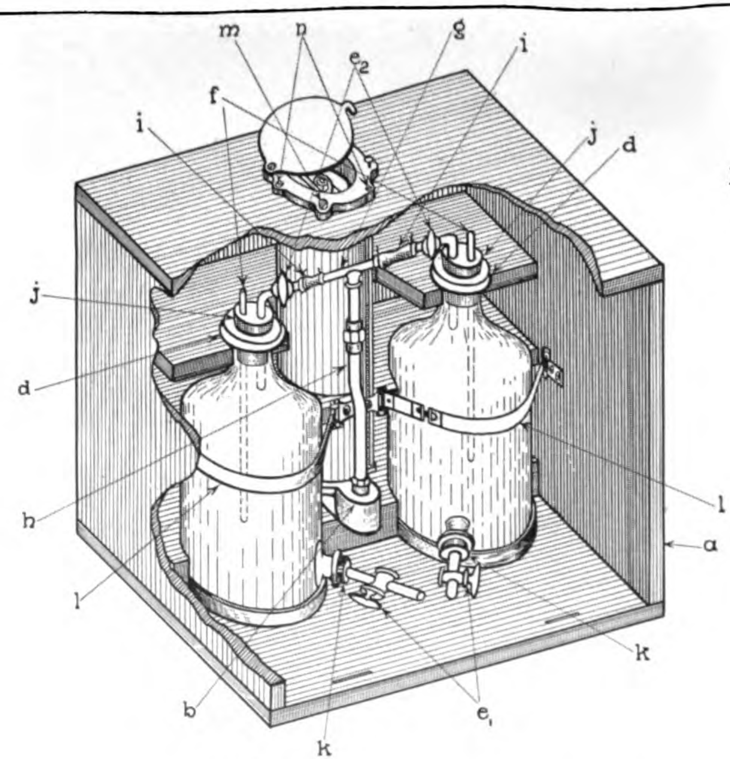
temperature variation; thus, a drop from 70° F. to 32° F. would entail a drop in pressure of over 2 inches of mercury. The apparatus remained perfectly tight under a positive and negative pressure of 6 inches of mercury—far in excess of any possible fluctuations in actual practice.

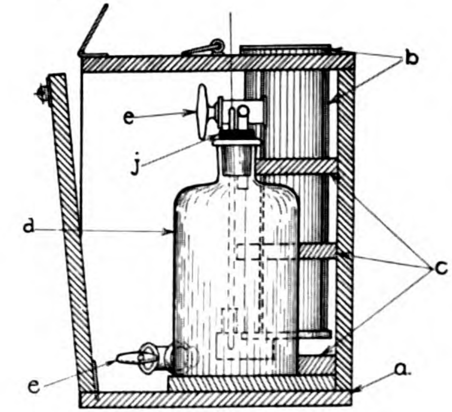
Directions for sampling: Open stopcocks E_1 and E_2, give 20 strokes to the pump, and close all stopcocks securely. If it is desired to sample from a spot where it is impracticable to place the instrument, carry rubber tubing connections from stopcocks E_1 to the location specified.

Precautions: Securely wire all stoppers to tubulatures of bottles; lubricate all stopcocks and secure with rubber bands; wire all rubber tubing connection; inspect interior of the pump from time to time for condition of valves.

The following question arises: How many strokes of the pump are necessary to obtain a representative sample of air? The combined volume of the two bottles is 4,000 c. c. and the air displacement of the pump is 800 c. c.; thus, in five strokes, 4,000 c. c. of air would pass through the apparatus; but this would be still contaminated by a small residual portion of the original air. This matter was tested by the following procedure: The sampling bottles were connected through stopcocks E_1 by rubber tubing of ¼-inch internal diameter with two openings into the interior of an air-tight room of 300 cubic feet capacity, the CO_2 content of which had been previously determined by a Haldane gas analysis apparatus. A sample was then drawn into the two bottles, using a definite number of strokes with the pump, the stopcocks then closed and CO_2 estimated in each bottle by the Haldane apparatus. The CO_2 percentage of the room and the number of strokes of the pump were varied from time to time. The data in the following table are typical of the results obtained. Each percentage represents an average of three analyses agreeing within 0.02 per cent.

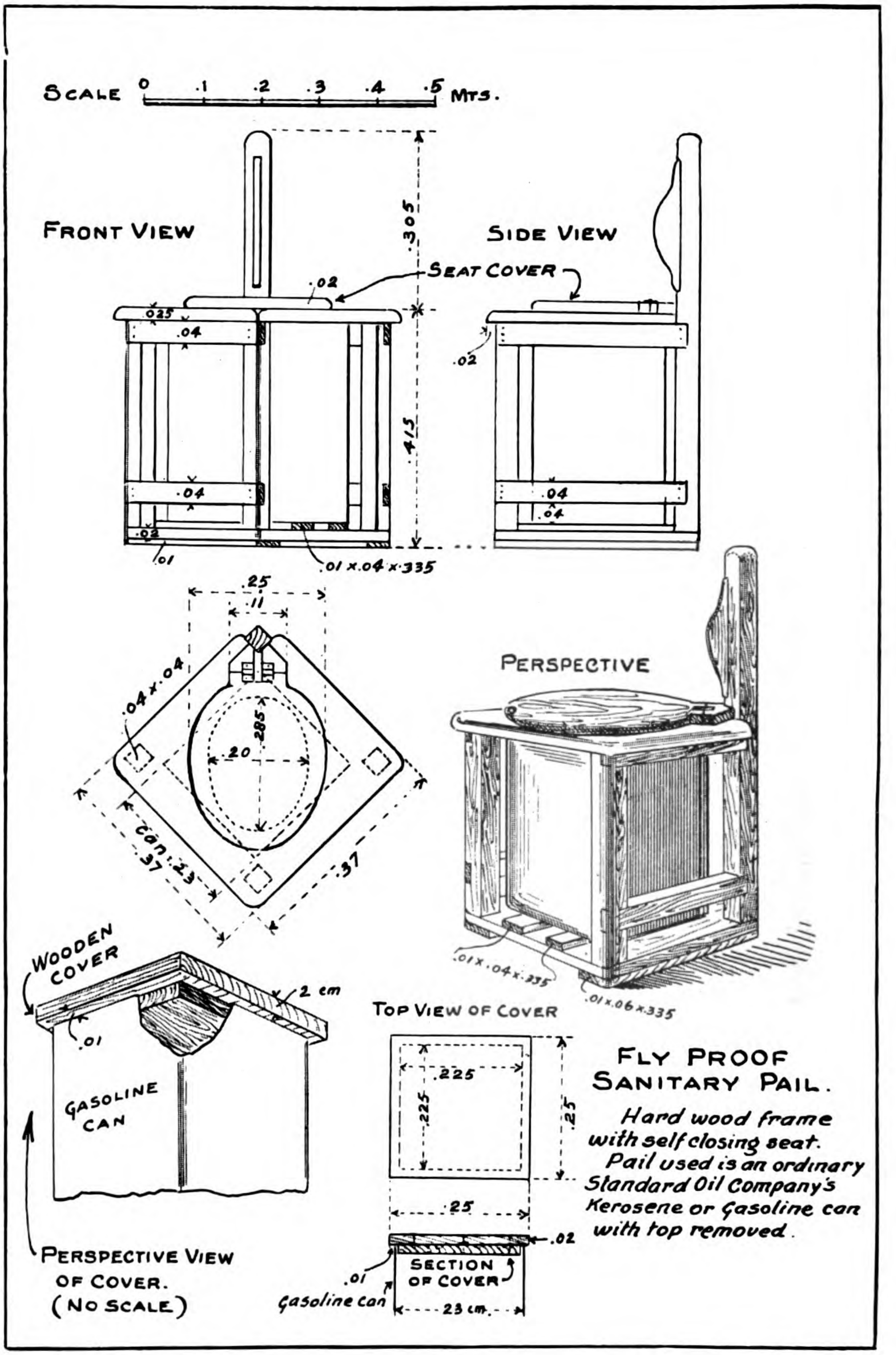
Average CO_2 per cent.			Number strokes of pump.
Air-tight room.	Bottle 1.	Bottle 2.	
0.78	0.73	0.74	10
.24	.18	.20	10
.24	.20	.20	10
.26	.20	.21	10
.26	.19	.20	10
.52	.47	.45	10
.80	.81	.79	15
.57	.56	.56	15
.23	.21	.21	15
.24	.23	.22	15
.27	.25	.24	15
.24	.22	.23	15
.25	.25	.27	15
.27	.26	.25	15
.25	.25	.25	15





Air Sampling Apparatus
For Use Aboard Ship - E.W. Brown, P.A. Surgeon U.S.N.
Nov. 26 - 1912

a - Case
b - Single Acting Suction Pump. (1130 C.C. Cap)
c - Supporting Shelves
d - Aspirator Bottles with Tubulature (2000 C.C. cap. each)
e - Glass Stop Cocks - $\frac{1}{4}$" Bore (Geissler's)
f - Thermometer (8" - 1°-100°C).
g - Reducing "T" Tube-Brass.
h - $\frac{1}{4}$" Brass Pipe.
i - $\frac{5}{16}$" I.D. Heavy Wall-Red Rubber Tube
j - #7 Rubber Stoppers (Eimer & Amend)
k - #3 Rubber Stoppers (Eimer & Amend)
l - Copper Straps.
m - Csk. Wood Screws.
n - Tie Rod Nuts.


SCALE 0 .1 .2 .3 .4 .5 MTS.
FRONT VIEW
SIDE VIEW
SEAT COVER
.305
.415
.02
.025
.04
.04
.02
.01
.01 x .04 x .335
.02
.04
.04
.25
.11
.04 x .04
.285
.20
can .23
.37
.37
PERSPECTIVE
.01 x .04 x .335
.01 x .06 x .335
WOODEN COVER
2 cm
.01
GASOLINE CAN
PERSPECTIVE VIEW OF COVER. (NO SCALE)
TOP VIEW OF COVER
.225
.225
.25
.25
.02
.01
SECTION OF COVER
Gasoline can
23 cm.
FLY PROOF SANITARY PAIL.
Hard wood frame with self closing seat.
Pail used is an ordinary Standard Oil Company's Kerosene or Gasoline can with top removed.

It is concluded from the above figures that a minimum of 15 strokes of the pump are required to obtain a representative sample; but it is recommended that 20 to 25 strokes be employed to allow a proper margin of safety.

A NEW DESIGN FOR A SANITARY PAIL.[1]

The need of a more satisfactory method for the collection of human excreta in places where modern sanitary plumbing is not available is often keenly felt, especially when it is necessary to supply it at a cost that is within the means of the ordinary householder, as well as within the means of the average municipality as regards the expense of collection and transportation to a suitable disposal point.

This new design for a sanitary pail has many advantages not found in other methods and meets the needs of economy, besides overcoming many objections to devices previously used. The pail has already been used very successfully in the Philippine Islands.

The frame is made preferably of hardwood and consists of four posts, set into a well-mortised frame. The posts are made of such height that when the seat is placed upon them an ordinary 5-gallon kerosene can may be slipped into the side of the frame and be close enough to the bottom of the seat to prevent the entrance of flies. The post at the back of the frame comes through so that it may serve as a handle by which the closet may be moved from place to place, and it also serves the purpose of making the lid self-closing. The can rests upon two cross strips, by which the close fit of the top of the can to the underside of the seat can be readily secured by either planing down the crosspieces when the can fits too tight or replacing them with thicker ones when it fits too loose. By this simple expedient the fit of the can need not be dependent upon absolutely accurate workmanship on the frame. The hole in the seat is cut diagonally because it makes the use of the closet more comfortable, as the feet can be put back. The hole is covered with a hinged seat, which is made self-closing by the projection which is put on the post which comes through the seat. The entire woodwork is sandpapered and then well varnished.

The closet has the advantage of being entirely open, which fact secures good ventilation and leaves no opportunity for the collection of dirt and retention of disagreeable odors, which are so common in the boxlike designs heretofore used. The entire frame can be readily cleansed. It is light, easily moved about, and where there is nothing better available can be used as a commode for a sick room.

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[1] The original article, by Surg. V. D. Heiser, U. S. Public Health Service, appeared in the Public Health Reports for July 25, 1913.

On account of the light weight of the can, as compared to the wooden pail, it is a much more simple matter to provide for an inexpensive daily collection system. The ordinary cart is admirably adapted for this service and can haul many more cans than it could pails, so that the cost can be kept down to a point which makes it possible to use a suitably located central pit or other means of central disposal. An ordinary night-soil pail costs from $3 to $5, while a kerosene can may be obtained generally at a cost not to exceed 10 cents. This makes it practicable to use a new container frequently. A wooden pail also has the disadvantage of retaining and giving off odors, which a can has not.

The cans should be collected every night and replaced with clean ones. The can as soon as it is removed from the frame should be immediately covered with a cover of the type shown in the plate.

The closet also has the advantage of being complete in itself. From a sanitary standpoint it is safe to use it anywhere; in an outhouse, barn, or any place not objectionable from an esthetic standpoint.

CLINICAL NOTES.

A CASE OF PARESIS WITH APPARENT REMISSION FOLLOWING NEO-SALVARSAN.

By R. F. Sheehan, passed assistant surgeon, United States Navy.

Attention is called to this case because of the apparent remission; also because the initial symptoms occurred during the previous enlistment, and evidently were quite marked before the present enlistment.

There is always difficulty in distinctly labeling this class of cases, due to the overlapping of syphilis, especially the cerebral type, locomotor ataxia, and paresis. The endeavor to group the two latter is shown in the use of the term taboparalysis. I have chosen to term this paresis, as it so appears, if we are to continue these conditions as clinical entities instead of regarding them as manifestations of syphilis according to the dictum of Fournier, which is substantiated by the recent work in the pathology of paresis.

The diagnosis of paresis is often incorrect. Errors occur in cases which clinically appear certain. E. E. Southard[1] quotes six cases, in which, despite the apparently characteristic symptoms, careful histologic examination at necropsy failed to show the essential features of the disease, such as plasma cells in the brain tissue. Other organic disease was present in all of them, including (*a*) meningomyelitis and subcortical encephalitis (syphilitic?); (*b*) tabes dorsalis and nonparetic cerebral disease, two cases; (*c*) arteriosclerotic brain disease, with severe cerebellar involvement, two cases; (*d*) cerebral sclerosis of the type of "perivascular gliosis."

The diagnosis of paresis is practically certain with cytologic examination of the cerebrospinal fluid, aided by the Wassermann reaction and Noguchi's butyric acid reaction.

In the perusal of the histories of a thousand paretics in the New York State hospitals, to note the mention of pupillary inequality, it was recorded in the majority as an early manifestation.

J. A., quartermaster first class; white; 31 years; United States; married. Family history good. Patient was first child of father's first marriage. His mother died following a difficult labor in giving him birth. Father had three children by second wife. These are alive and well. Father died, aged 50 years, cause unknown.

Personal history is negative. Patient states that "as a child was not strong, but was never sick." He enlisted in the United States Navy on November 8, 1900. Had made good progress, being rated

[1] Jour. Nervous and Mental Dis., 1910, p. 1.

coxswain and subsequently quartermaster. His health record is clear until April 8, 1911, when there is an entry of chancroid, acquired during service on the Asiatic Station. This diagnosis was not changed. To his knowledge he never had any secondaries. He was discharged from the service by expiration of enlistment in December, 1912. He remained out of the service for four months and then reenlisted, being married in the meantime. During this interval he first noticed symptoms. He began to feel "dopey" and would fall asleep most any time. He tired easily. There was a pain between the shoulders. He had trouble in walking in the dark. In going through a dark hall in his home it was necessary for him to feel his way along by touching the walls. He was uncertain, always fearing that he would stumble or fall. At this time he noticed that others could walk through the same hall easily. In walking he did so with his head bent forward to watch his feet, especially in going down stairs. He distinctly recollects being dizzy when bending to wash his face upon getting up in the morning. He had trouble reading the newspapers, as they became blurred. He also had difficulty in dressing, which provoked him; he could not account for it. He also noticed that in shaving he frequently cut himself, and that when he did so he bled freely, the bleeding being difficult to stop, and the blood unusually dark in color. There is no history of crises or disturbances of micturition. He has always been addicted to excessive venery. Since his present trouble began he has been aware of diminished sexual desire, impaired function, and premature ejaculation. On March 7, 1913, he reenlisted as quartermaster, first class. He was ordered to a battleship for duty. In June, 1913, he had trouble with his vision, became easily fatigued, and was continually sleepy. He was admitted to the sick list with "amblyopia," origin duty, incident to 12 years' service. Record reads as follows:

About three months ago complained of headache and inability to quickly and readily distinguish the points of the compass or properly perform the duties of a quartermaster. Upon medical officer's recommendation he was given duty as master-at-arms, which he has been performing since. At this time he claims there has not been any improvement. Vision 16-20. It is considered there is an error of refraction which could be relieved by glasses.

July 7, 1913, he was transferred to a naval hospital; here he was examined by an opthalmologist, who reported that "the condition was probably specific." Wassermann reaction strongly positive. Pupillary reaction sluggish and right pupil somewhat larger than left. Diagnosis changed to syphilis.

July 12, 1913. Neosalvarsan 0.9 gm. intravenously: (1) Placed on mercurial treatment.

July 16, 1913. Neosalvarsan 0.9 gm. intravenously (2).

July 26, 1913. Wassermann reaction negative.

August 8, 1913. Neosalvarsan 0.9 gm. intravenously (3).

August 21, 1913. Wassermann reaction plus 4. No disturbance of vision. No headache. No open lesions. Right pupil remains as at entrance, considerably dilated.

September 18, 1913. Neosalvarsan, 0.9 gms intravenously (4).

October 1, 1913. Wassermann reaction negative.

October 7, 1913. Neosalvarsan 0.9 gms intravenously (5). Wassermann reaction plus 1. Right pupil dilated. General condition good.

October 10, 1913. To duty; relieved. No visible lesions present, but it is recommended that mercurial treatment be continued.

He reported aboard ship October 18, 1913, and upon examination stated that he was "troubled by his stomach filling up with gas," also that after sitting down for any length of time his legs became numb and tingled as if asleep. He occasionally has slight headaches, but generally feels all right. He has some trouble in walking in the dark, but to do so does not make him dizzy. He appears nervous. Vasomotor disturbance is shown by marked blushing. There is hesitancy in opening eyelids. The pupillary fissures are equal. There is pupillary inequality, the right being dilated. Pupils react to light and accommodation, but sluggishly. The right, however, does not contract below a certain aperture, which is regular. There is a slight Rombergism. Tendon reflexes quite normal. Gait good, but studied. Sensation in lower extremities is delayed. No active lesions are evident.

October 19, 1913. Placed upon weekly muscular injections of hydrag. succinimide 0.06 gm.

October 20, 1913. Patient states that he is much better than before going to hospital for treatment and that his vision has improved. He feels stronger and is more ambitious. The pain between shoulders has disappeared. He is able to go up and down ladders much better. He walks better, being able to hold his head erect, as he does not have to watch his feet. He can read and write very well. He rarely cuts himself in shaving, and notices that if he happens to do so that he does not bleed as freely nor is the blood as dark as formerly, the bleeding stopping itself. He has gained about 18 pounds in weight, and sleeps better. His appetite has improved. He does not become as tired. He claims that his speech is all right. It seems hesitating.

He was permitted to perform his duty, as the ship was in port. Being kept under observation, it was noticed that day after day he was beginning to have trouble in performing his duty. He had difficulty in remembering the routine details of his watch, such as sending steamers away in time and lowering the guard flag at colors.

November 19, 1913. Admitted to sick list. Examination shows that left pupil reacts sluggishly to light and accommodation, not contracting below a certain aperture, which is comparatively dilated. There is slight nystagmus, both horizontal and vertical. Consensual reflex is present on both sides, but the right is impaired because of the pupillary rigidity. Pupils react some what to sympathetic stimulation. Vision: O. D. 20–20, O. S. 20–20. Color perception good. Ability to corrugate forehead is less on right side. Tongue is protruded to the right. Hearing, taste, and smell normal. There is a slight syllable stammering in repose, which is aggravated during excitement, when there is also noticeable hesitancy in speech and marked blushing. There are also occasional fibrillary twitchings about face. Patellar reflexes exaggerated with slow return. No ankle clonus. No Babinski. No Oppenheim. Plantar reflexes diminished. There is marked analgesia in both lower extremities. The gait is fairly good, but slow and ataxic. There is difficulty in going down a ladder. When blindfolded he walks with abnormal difficulty and is unable to maintain his direction. The deviation is not to one side more than another. Slight Romberg.

Patient states that sometimes when he begins to speak he can not say what he wishes and is compelled to begin over. He realizes that he is more irritable than formerly.

November 20, 1913. Patient transferred to naval hospital for further observation and treatment.

CASE REPORTS FROM GUAM.

By E. O. J. EYTINGE, passed assistant surgeon, United States Navy.

ABORTION DUE TO ADMINISTRATION OF SALVARSAN.

A female Chamorro, aged 24 years, was admitted to the naval hospital, Guam, March 19, 1913. Patient had been under mixed treatment, intermittently, for gangosa since 1904. At time of admission an open gangosa lesion of the left leg was present. On admission mixed treatment was discontinued and during the following week a round, whip, and hookworm infection was treated.

On March 23, 1913, at 11 a. m., salvarsan, 0.6 gm., was administered intravenously. A sharp reaction followed, with chills, vomiting, and a temperature of 102° F. The following morning, at 1.15 a. m., the patient unexpectedly aborted, giving birth to a fetus of about the sixth month development. No further complications occurred and the patient went on to a speedy recovery.

The pregnant state was unsuspected, because the patient said nothing about it, and was unmarried, and, so far as appearances go, all Chamorro females appear pregnant, even the smaller girls, owing to the custom of tightly constricting the waist at the lower part of the thorax with a narrow band. This results in a characteristic protuberant abdomen. Outside of the salvarsan there was no known cause of the patient's aborting.

TUBERCULOUS MASTOIDITIS WITH SPONTANEOUS PERFORATION.

A Japanese girl, aged 4 years, was admitted to the naval hospital, Guam, October 21, 1912. Had a discharge from the right ear for a long time. Father does not know when it began. Six months ago a spontaneous perforation of the right mastoid took place, and since that time discharge from both ear and perforation have been profuse, the cervical glands have enlarged, and the child has failed generally.

The condition is well seen in the photograph. The discharge was profuse and showed a heavy mixed infection. The mastoid perforation was circular and one-eighth inch in diameter, with an ulcerated area of skin about it. It lay one-half inch behind the external auditory meatus. A second opening was due to pus tunneling beneath the skin. The cervical glands were enlarged and showed two points of softening. No other focus was found.

Treatment: A round, whip, and hookworm infection was eradicated. Food and tonics were pushed. The ear was kept clean with a solution of formalin. Solution entering through the perforation would run out through the auditory meatus. There was little improvement either local or general, the temperature slowly rising to 104° F., and the white cells to 21,800, with 94 per cent polymorphonuclears.

TUBERCULOUS MASTOIDITIS WITH SPONTANEOUS PERFORATION.

FATAL CASE OF ANCYLOSTOMIASIS.

On November 12, 1912, under ether anesthesia, a complete mastoid operation was done, all the cavities being thrown into one. Much carious bone was removed. The cervical glands were not touched, as the condition of the patient did not warrant prolonging the operation. Following operation the skin about the spontaneous perforation sloughed. A partial right facial paralysis appeared and the discharge ceased. The cervical glands slowly broke down and the patient failed rapidly, dying on December 21, 1912.

Post-mortem showed a generalized tuberculosis with an internal hydrocephalus. It is evident that no local proceedings would have helped the patient, and had it been realized that the tubercular infection was so widespread operation would not have been attempted.

SPONTANEOUS HEMORRHAGE IN THE NEW BORN.

A female Chamorro infant, 3 days old, was admitted to the naval hospital, Guam. The father stated that bleeding had been going on for several hours. On admission the infant was bleeding from the nose, mouth, ears, eyes, and from the vagina, and subcutaneous hemorrhages were present all over the body. Six cubic centimeters of the father's whole blood was immediately injected beneath the right scapula, the blood being obtained from the median basilic vein. The treatment was extremely effective. Bleeding ceased in a short time, the patient reacted, and went on to recovery without further treatment.

PSEUDO-FIBROID OF UTERUS.

A Chamorro multipara, aged 42 years, was admitted to the naval hospital, Guam, January 26, 1913. History unimportant up to eight months ago, when menstruation began to be irregular and prolonged. Has been menstruating freely for 15 days and is growing weak. Examination showed a steady drip of blood from the cervix. The cervix showed an old stellate tear. On bimanual examination a mass the size of a child's head was felt, springing from the fundus, hard, nodular, and moving with the uterus. A diagnosis of fibroid was made. The hemoglobin was 70 per cent and red cells 2,420,000. Stools showed the regular round, whip, and hookworm infection met with in every case in Guam. The bleeding diminished a good deal under a few hours' rest in bed, and on the following day the patient was curetted. The cervix was soft and the old scar tore open, requiring suture. Uterus packed, packing being removed in 24 hours, and ergot begun. On February 2 there was still slight oozing, with no change in the tumor.

A vigorous course of thymol and santonin was begun. Some hundreds of roundworms were passed, and coincidently the tumor dis

appeared, apparently having been a mass of roundworms. Patient was discharged well, February 23, 1913.

In Guam we are willing to ascribe almost anything to worms, but the clinical picture of fibroid was so clear that a doubt never entered the mind of the medical officers who examined the case. I am unable to state why the tumor moved with the uterus.

PNEUMOCOCCUS ARTHRITIS IN INFANT CURED BY REPEATED ASPIRATIONS AND INJECTIONS.

A male Chamorro infant 18 months old was admitted to the naval hospital, Guam, October 17, 1912.

History: For the past week the infant has cried whenever the left hip was touched or moved. On admission the left hip joint was a little distended. It was tender to touch and motion was painful and resisted. There was no primary focus for infection found. Temperature subfebrile and infant in good condition.

Treatment by overhead suspension (Bryant) was begun and continued until October 31, 1912. During this time the general health remained excellent, the pain was relieved, but swelling of joint increased. The temperature rose slowly to 102° F. The while cells were 16,800, with 65 per cent polymorphonuclears. On this date, under chloroform anesthesia, the left hip joint was aspirated, and thick yellowish-green pus removed. The joint was then filled with a 2 per cent solution of formaldehyde in glycerin and suspension renewed. Cultures were made from the pus, and the pneumococcus in pure culture recovered. A slight reaction followed, but the white cell count and the temperature did not subside. On November 2, 1912, under chloroform anesthesia, aspiration and injection were repeated. Pus was abundant, but thinner. Again there was little change following aspiration. On November 7, 1912, the hip was more distended than ever. Anesthesia, aspiration, and injection repeated. A large quantity of very thin, light-yellow, purulent fluid was removed. A larger amount of the solution, 8 c. c., was injected. One week afterwards temperature was normal and movement in joint free and almost painless. Suspension was removed. Five days later the temperature began to rise and an abscess of the soft tissues of the left hip developed. Free incision was followed by cure. This abscess did not involve joint or bone and was, of course, due to infection of the soft parts during aspiration. The patient was discharged on January 16, 1913.

At this time the scar of the incision for the relief of the abscess was the only indication that the patient had been ill. Motion was free, normal in range, and painless.

I do not believe that a like result could have been obtained by open operation. Some ankylosis would have been sure to have followed drainage. The formaldehyde solution was prepared as Murphy directs, being allowed to stand 24 hours before use.

A FATAL CASE OF ANCYLOSTOMIASIS.

A Chamorro girl, aged 3 years, was admitted to the naval hospital, Guam, November 4, 1912. The mother stated that the child had been ill for a long time with weakness and general swelling of the body. On admission the child showed a general edema and anasarca. The anasarca was pronounced in the abdomen, and the edema was most marked in the feet, hands, and eyelids. The edematous tissue pitted on pressure. The complexion was waxy, and the mucous membrane bloodless. The viscera were normal. Mentally the child was dull and apathetic. The temperature was subnormal. The urine was normal; the stools showed a round, whip, and hookworm infection, the hookworm infection being very heavy. Blood examination: Hemoglobin, 35 per cent; red cells, 1,070,000; white cells, 11,000 (polymorphonuclears, 62 per cent; small lymphocytes, 20 per cent; large lymphocytes, 7.5 per cent; large mononuclears, 3 per cent; eosinophiles, 4 per cent; transitionals, 1.5 per cent). The photograph taken at this time pictures the condition very graphically. Treatment with santonin and thymol was begun and pushed. Roundworms soon disappeared. Repeated doses of thymol as large as 2 drams failed. The stools continued to show the massive hookworm infection. The patient grew steadily worse. On December 14, 1912, the red cells were 810,000, with hemoglobin 15 per cent; the white cells 6,400 (polymorphonuclears, 68 per cent; small lymphocytes, 21 per cent; large lymphocytes, 7 per cent; large mononuclears, 3 per cent.) The eosinophiles had disappeared. During the latter part of the course fresh thyroid feedings were tried, with no benefit. Patient died December 20, 1912.

Post-mortem showed a typical picture of profound anemia; the contrast between the pale and bloodless viscera and the yellow fat was very marked. The upper part of the small gut was alive with hookworms, the entire wall being lined with them. Many whipworms were present in the colon. Thymol failed utterly in this case.

TWO CASES OF MILD TETANUS.

These cases are reported, not because mild tetanus is rare or especially difficult of recognition, but because tetanus seems to indicate, to the writer at least, such a clear-cut clinical entity that mild, atypical cases are extremely likely to be passed over unless the condition be kept in mind.

Case 1.—A Chamorro boy, 12 years of age, was admitted to the naval hospital, Guam, July 7, 1912. Previous history unimportant. Present history: Several days ago pain in the back and difficulty in walking set in. Both symptoms have been growing worse, and were the only symptoms complained of on admission. At this time examination showed a well-developed boy, in a position of orthotonus. The muscles of the trunk and lower extremities were rigid; the spine straight, and tender to percussion; the legs stiffly extended. The upper extremities were less affected, the neck very little, and the jaws not at all. The reflexes were generally increased. This rigidity, while tonic, could be relaxed under strong persuasion to such a degree that voluntary bending of the spine and walking a few steps in a stiff-legged manner could be carried out. The tonic condition also showed exacerbations responding to any stimulus. The body was bathed in a profuse acid and offensive perspiration. The viscera were normal. Temperature, 100° F., with corresponding pulse and respiration. White cells, 9,400 (polymorphonuclears, 88 per cent; large lymphocytes, 16 per cent; small lymphocytes, 12 per cent; eosinophiles, 4 per cent). Urine normal. Stool showed a round, whip, and hookworm infection. The mental condition was peculiar, the patient being in a condition of constant terror. Tetanus was, of course, suspected, and a scab was removed from a slight wound of the right foot, sustained about two weeks before. Smears from this wound were negative.

Course of the disease: For the next week the temperature remained about 100° F. There was little change in the white cells. The sweats became more profuse. The mental condition gradually improved. The tonic spasm spread to the upper extremities, the neck, and jaws in succession, and swallowing became difficult. Finally a clonic winking spasm of the eyelids appeared. After a week all symptoms gradually disappeared and the patient was discharged on August 6, 1912. No specific treatment of any kind was used. Morphine and bromides were given at times. Considerable difficulty was experienced in the diagnosis of this case, chiefly because of the late involvement of the jaws. We were inclined to place it in the category of cases described by Osler, as follows:

> Escherich has described in children a form of generalized tonic contractures of the muscles of the jaw, neck, back, and limbs, usually a sequel of some acute infection, occasionally occurring as an independent malady. The contractures may be either intermittent or persistent. The condition may last from a week to a couple of months. The cases as a rule recover.

Such being the case, prognosis was good, and no special treatment was required. The condition having been recognized, the twin case was expected, and was admitted on September 29, 1912.

Case 2.—A Chamorro boy, aged 16 years. Past history unimportant. Present history began two weeks ago, when he sustained a trauma to the left ankle, which is now healed. For two days had pain in back and difficulty in walking. On admission there was slight rigidity of trunk and lower limbs, tonic, and greatly increased on the slightest stimulus. The jaws were not involved. There was no difficulty in swallowing. The perspiration was acid, offensive, and profuse. The reflexes were increased and the mental condition normal. Viscera normal. Temperature 100° F., pulse and respiration corresponding. White cells, 12,000 (polymorphonuclears, 62 per cent). Urine normal. Stools showed a round, whip, and hookworm infection. The wound was reopened, but no organisms were found. The second case was so similar to the first one that a correct diagnosis was made at once, and a favorable prognosis given. This case ran along similar to the first one and recovered without special treatment, going home October 31, 1912. Prior to these two cases the only tetanus in Guam of which I have knowledge has been the usual severe and classical type. It has generally been fatal here, and subsequent to these cases one fatal case has been noted. As the *B. tetani* is a common organism in Guam, it is probable that mild types of infection are more frequent than has been noted.

TWO CASES OF PUERPERAL SEPSIS.

Case 1. Puerperal sepsis; nephritis; recovery.—A Chamorro multipara, aged 42 years, was admitted to the naval hospital, Guam, January 18, 1913. Labor six days ago, the child being born before the arrival of the midwife. Otherwise labor was normal. For two days fever and pelvic pain have been present.

On admission patient complained of pelvic pain and painful, scalding micturition. The temperature was 102.3° F. White cells, 9,000 (polymorphonuclears 46 per cent). The lochia was offensive but not foul. Per vagina, the parametria were markedly infiltrated, hot, throbbing, and very tender to pressure. The urine was scanty, acid, bloody, and contained a trace of albumin, with considerable pus, epithelium, and a few casts. Stools showed a round, whip, and hookworm infection. The case was considered one of puerperal sepsis, with secondary nephritis. Prognosis was considered poor. Treatment: Free catharsis, liquid diet, and an alkaline diuretic mixture.

Course of the disease: The nephritis cleared up rapidly, but three days later two severe chills with vomiting and temperature 103° F. appeared. The white cells rose to 15,200 (polomorphynuclears 88 per cent). The infiltration on the left parametrium had increased to the size of an orange; on the right, at least half again as large, extending down into the pouch of Douglas. Both sides were very

hard; no points of softening present. The diuretic mixture could not be retained and was stopped. Fowler's position and Murphy's proctoclysis begun. Six days later patient was much better, only 0.3 per cent albumin being present and no casts. The temperature was only slightly elevated, but there was no change in the infiltration in the parametria. All treatment was stopped, and two large, very hot vaginal douches were given daily. From this time on the infiltration steadily diminished until the patient was discharged, February 23, when it had reached a stationary point, moderate thickening remaining, with slight fixation of uterus. Two days after the vaginal douches were begun a cystitis appeared, but the urine entirely cleared up and was normal on discharge from hospital.

Case 2. Embryotomy; puerperal sepsis; death.—A Chamorro, aged 23 years, was admitted to the naval hospital, Guam, November 21, 1912, with the following obstetrical history: Two normal labors, the last 18 months ago. Is now at full term and labor began 24 hours ago. Examination showed a transverse presentation, with hand protruding from the vagina. The child was dead and stinking. The odor was so foul that death must have taken place days before. No dependence can be placed upon a history obtained from a Chamorro, especially if there is anything to conceal, such as criminal delay, as there was in this case. The cervix was fully dilated, very edematous, and elongated so that the external os was level with the vaginal outlet. Under chloroform anesthesia decapitation with scissors was performed and the uterus cleaned out. As the uterus did not contract well, it was lightly packed. The odor during the operation was so bad that most of those present parted with their latest meal. Operation was followed by severe shock; reaction slow.

Treatment: Proctoclysis of salt solution and intrauterine douches of 50 per cent alcohol. During the next eight days the temperature ranged from subnormal to 106° F., and was of the septic type. Chills were frequent and severe. There was a profuse, foul-smelling, purulent discharge from the uterus. White cells never went over 4,400 (25 per cent polymorphonuclears). There was never any abdominal pain or rigidity or other sign of peritonitis present. There were no foci found outside of the uterus. On the ninth day patient collapsed and died at 1 p. m.

Autopsy showed general peritonitis, with gangrene of the upper half of the uterus. The gangrenous portion was adherent to the small intestines and came away with them when they were lifted away from the uterus. The interior of the uterus was one sloughing mass. This case may be classed with the "flat-bellied peritonitis" group of cases, in which the peritonitis present gives no special symptoms and is a sign of low resistance and fatal outlook. The case can not

be regarded as showing the value of intrauterine alcohol irrigations, as it was hopeless from the start.

Both cases point to the value of operative noninterference in puerperal sepsis unless there are very definite indications for it. Operation on the first case was not required, although vaginal drainage was considered in case softening should occur. Operation in the second case would surely have resulted in perforation of the uterus, and the operator would always have been in doubt as to whether or not he was the cause of the peritonitis. Most of the cases of puerperal sepsis in Guam get well or die, more frequently the latter, irrespective of any special form of treatment.

STAB WOUND OF ASCENDING COLON; SUTURE, RECOVERY.

By H. C. Curl, surgeon, United States Navy.

F. F., a Filipino, was stabbed in the right side while lying in his bunk. The knife used had a long, slender blade and was sharp. One wound in the arm was unimportant, but the second penetrated the abdomen. The severity of the case was not recognized at the time of occurrence, but as the man was suffering considerable pain the next morning he was transferred to the hospital, where an exploration demonstrated that it was a penetrating wound and he was prepared for operation.

An ample incision in the line of the fibers of the external oblique allowed free access to the right side of the abdomen, and on opening the peritoneum free blood and fecal matter were seen.

An opening in the external surface of the ascending colon was found; it was 1½ inches long in the serous and muscular coats, but only three-fourths inch long in the mucosa. A double row of sutures closed the opening and inverted the serous coat. Free fecal matter was removed from the peritoneum, the region mopped dry, and wound closed, except for a drain between ascending colon and lateral abdominal wall.

The external stab wound was also drained.

Recovery was rapid and uneventful, there being no tendency to spreading peritoneal involvement, and demonstrated the efficiency of early closure of gut wounds with limited drainage.

PERFORATION OF A DUODENAL ULCER—OPERATION TWENTY-TWO HOURS LATER—POST-OPERATIVE COMPLICATIONS.

By H. F. STRINE, surgeon, United States Navy.

J. J. B., C. M. M., United States Navy, aged 35, while at work about noon January 8, 1912, was suddenly seized with severe pain in the epigastric region. There was no previous history of indigestion or abdominal pain.

When examined 21 hours later the picture was that of peritonitis, pulse 118, respirations 38. Exploratory laparotomy revealed a large perforated duodenal ulcer near the pylorus, with bile-stained intestinal contents, containing undigested particles of food in the right side of the peritoneal cavity and pelvis. The opening was closed in the usual manner and the peritoneal cavity mopped dry with gauze pads. Drainage was provided by placing large rubber tubes to the point of perforation, beneath the liver, right renal pouch, and pelvis—Fowler's position and Murphy's proctoclysis. His condition during the afternoon and night was critical.

From January 12 to 17 temperature remained under 100° F. and pulse 90–98. Bowels freely flushed and convalescence appeared to be established.

January 19 temperature rose to 101.8° F., pulse 120, leucocytes, 22,000. A mass was located in the left side of the pelvis, and under local anesthesia the peritoneal cavity opened, foul-smelling pus evacuated, and drainage provided. Marked general improvement followed until January 23, when temperature, pulse, and leucocytes again increased. A collection of pus was located in the region of the appendix, evacuated, and drained.

General improvement again followed until January 28, when a low-grade remittent type of fever set in, with increasing leucocytes. The abdomen appeared in good condition and no collection of pus could be located.

February 8, patient septic, liver 2 inches below free border of the ribs and exquisitely tender on pressure over the gall bladder. Under general anesthesia this region was explored, but no pus found. The liver was forced downward and to the left. The anterior incision was then closed and a posterior subphrenic abscess located and drained. Again there was improvement for five days, then a return of remittent fever.

February 14 he complained of pain and tenderness along the course of the right femoral vein, middle third of thigh.

February 16, leg swollen, temperature 104° F., patient intensely septic. Under novocain, an incision was made over the saphenous opening with a view of ligating the femoral vein; however, this idea was abandoned when it was observed that the femoral vein was

clotted to the point of entrance of the saphenous vein, which was not involved. Femoral vein drained below.

From February 18 to 22 temperature 103°–105° F.; right leg enormously swollen. Numerous incisions made in the thigh to relieve edema and provide drainage. Annoying cough at night.

February 26, slight general improvement, severe attacks of coughing, respirations 32. Area of flatness on percussion and absence of breath sounds right middle lobe. Aspirated, but no fluid was found.

March 1, patient extremely emaciated. Repeated aspirations of right side of chest negative. Prognosis appeared hopeless, profoundly septic.

March 2, during the night patient stated that something "broke loose" in his lung and he coughed up a large quantity of foul-smelling pus. His temperature dropped to normal and from this time on recovery was rapid and uneventful. The swelling of the right leg gradually subsided.

April 29, patient had exceeded his normal weight and was discharged to duty.

This case is presented as interesting not from an operative standpoint, but from the numerous annoying complications and final fortunate spontaneous rupture of the lung abscess with complete recovery. Operation was performed about 22 hours after perforation. Soiling of the peritoneum was extensive, the left upper quadrant being practically the only large area that escaped contamination.

TWO CASES OF BONE SURGERY.

By Raymond Spear, surgeon, United States Navy.

Case 1. Injury to ankle joint.—R. E. B., aged 25 years, was injured in the gymnasium by falling a distance of 17 feet from the flying rings on December 28, 1911.

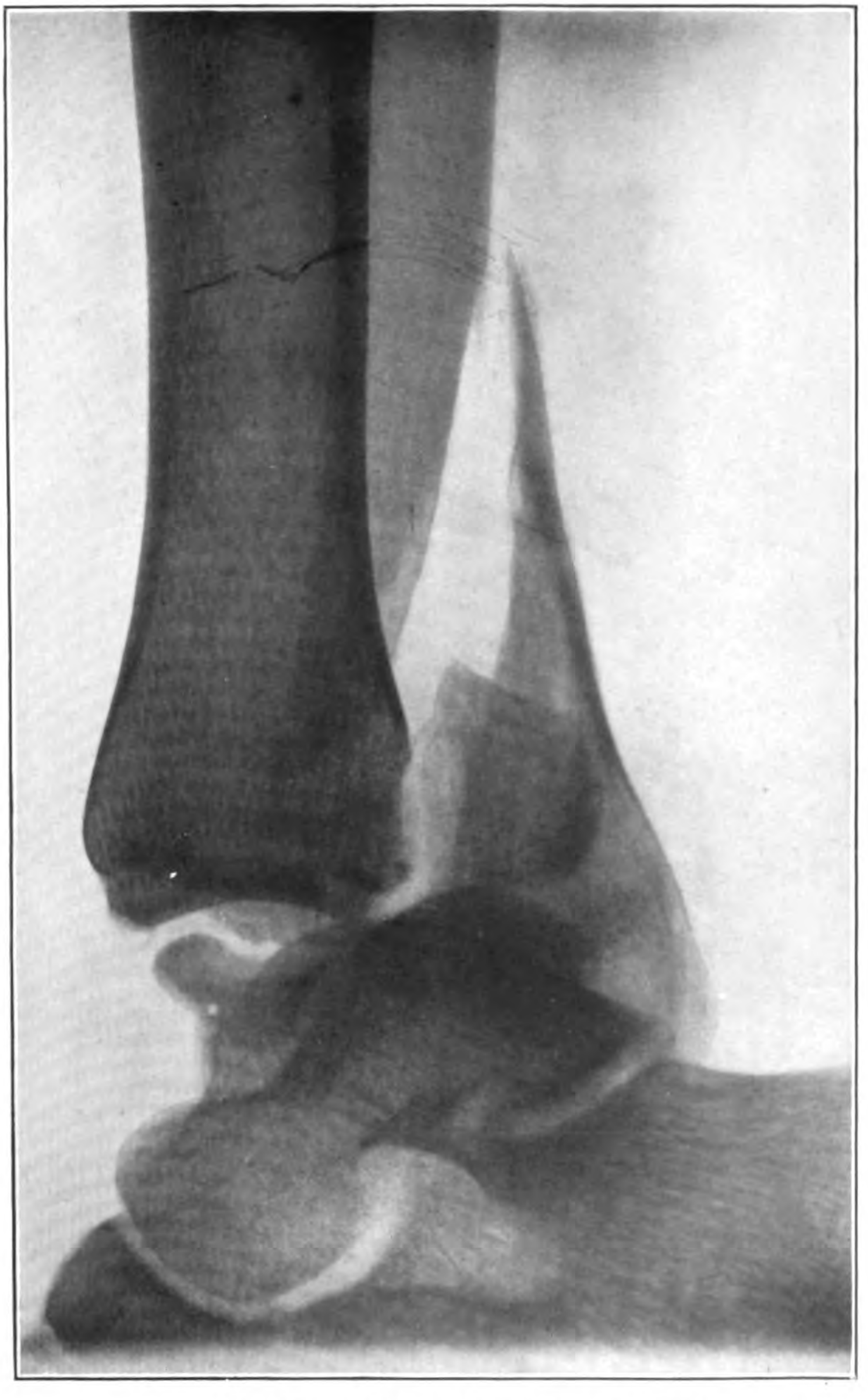
Figure 1 shows a fracture of the lower end of fibula and fracture of both malleoli of tibia. Good union resulted in the fibula and outer malleolus, but the inner malleolus was tender; joint motion was restricted and painful. Figure 2 shows the inner malleolus ununited and projecting into the joint. On April 23, 1913, ankle joint was opened through the internal lateral ligament, the fibrous tissue between the bone fragments was removed, the fractured malleolus was pulled out of the joint and held in proper position by means of a wire nail, as can be seen in figure 3. The ankle joint is now strong, he walks without a limp, and all motions are free.

Case 2. Osteochondroma of femur.—T. E. C., aged 18 years. Growth started when quite young. No distinct history of injury. During past year the tumor, which had the form of a spur, grew con-

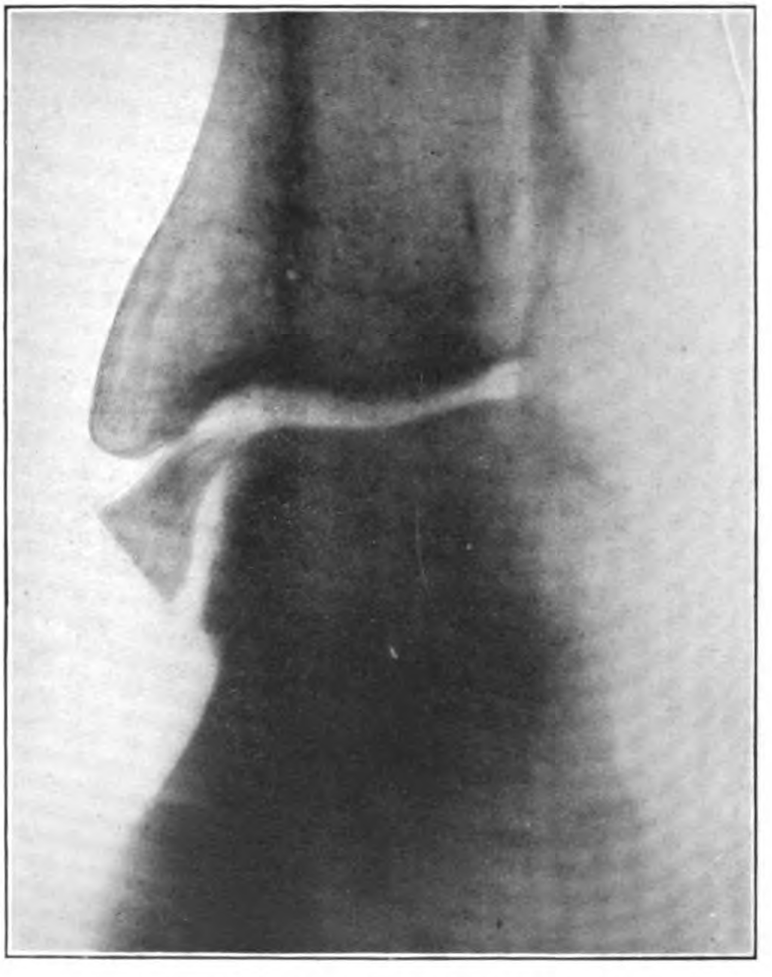
siderably and interfered with bending the knee. The outer hamstring muscles caught on the growth and caused considerable discomfort. (fig. 1.)

Joint was opened externally and the growth removed by the method of Lane. Over the growth there was a large bursa communicating with the knee joint proper. A second X-ray picture (fig. 2) was taken six weeks after operation and shows no return of tumor. The motions of the knee are now normal.

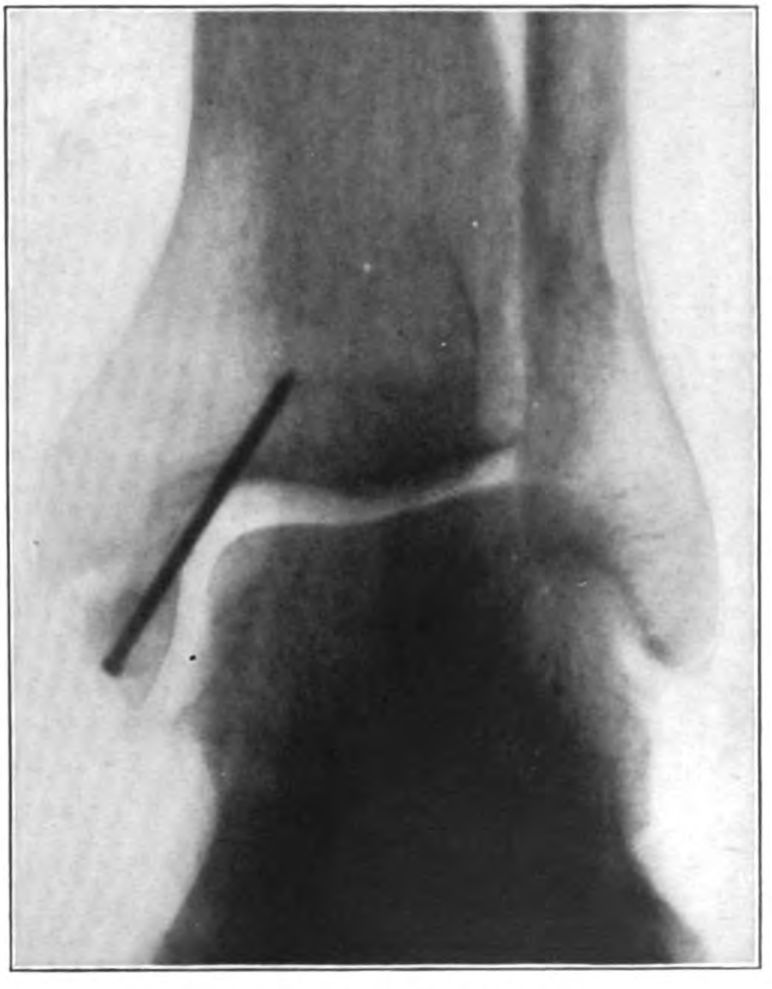
A photomicrograph (fig. 3) made by Hospital Apprentice (first class) L. Avery, United States Navy, shows the tumor to be an osteochondroma.



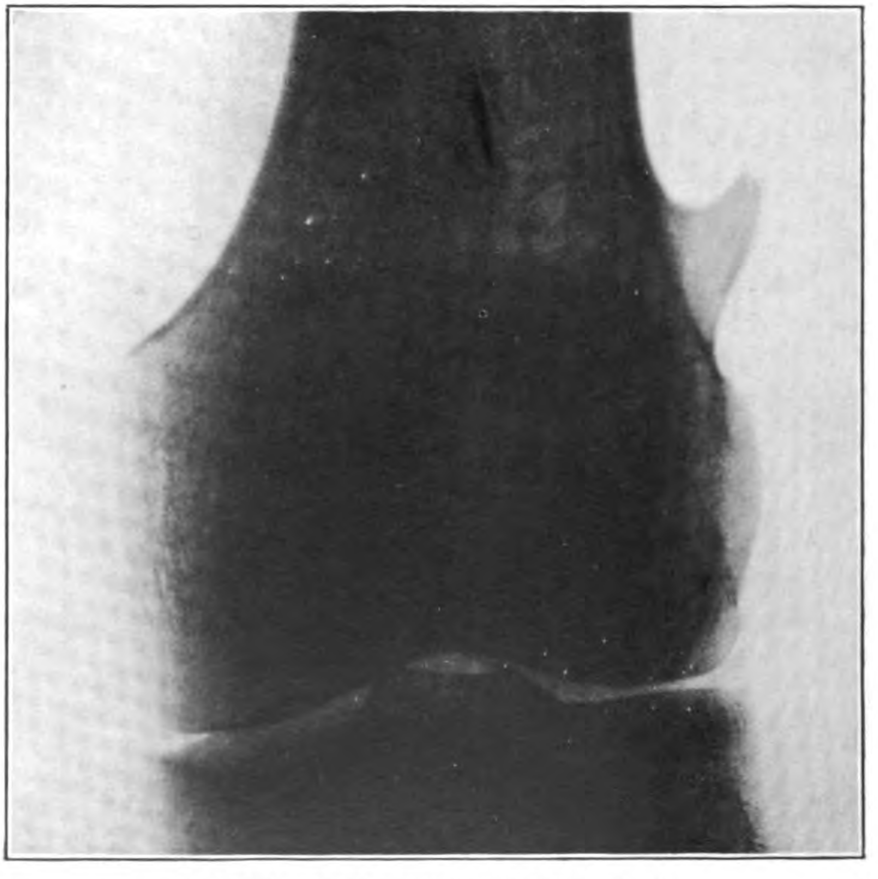
CASE I, FIGURE I, ON ADMISSION TO HOSPITAL.



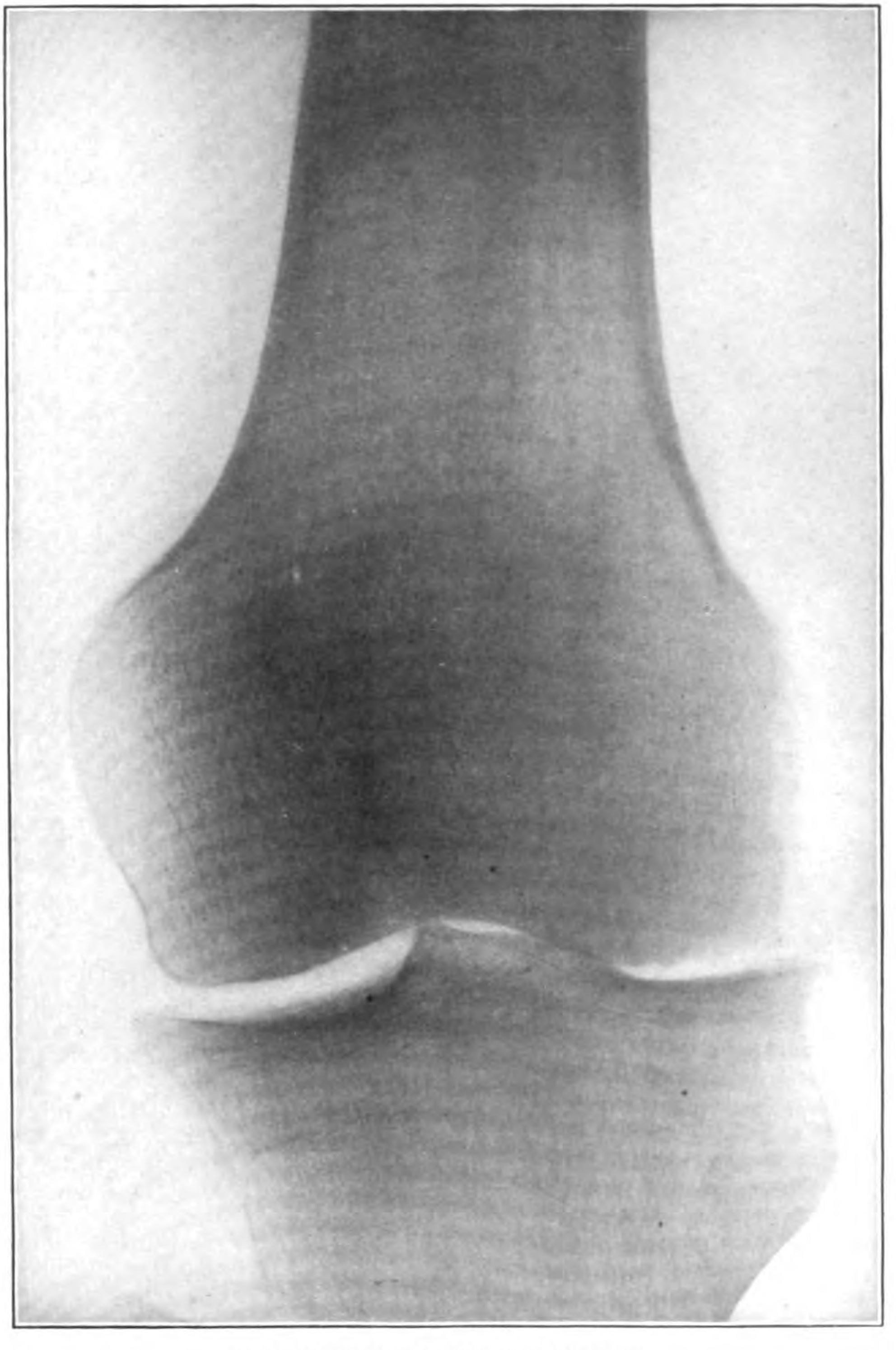
CASE I, FIGURE II, BEFORE OPERATION.



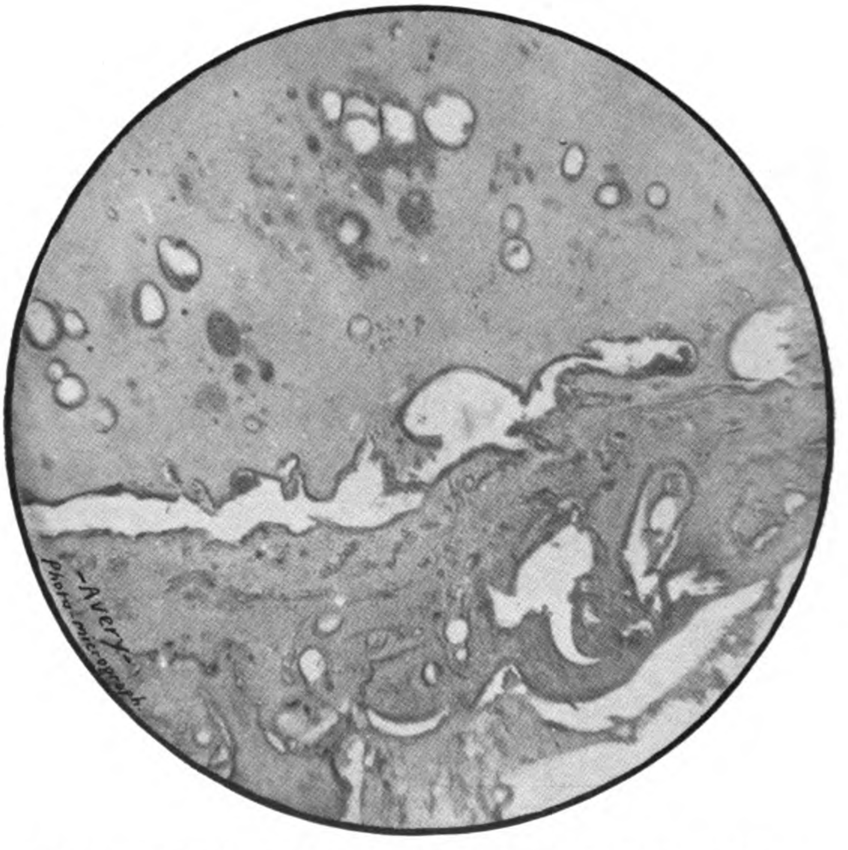
CASE I, FIGURE III, AFTER OPERATION.



CASE II, FIGURE I, BEFORE OPERATION.



CASE II, FIGURE II, AFTER OPERATION.



CASE II, FIGURE III, SECTION OF TUMOR—OSTEOCHONDROMA.

EDITORIAL COMMENT.

BRIG. GEN. GEORGE H. TORNEY, SURGEON GENERAL UNITED STATES ARMY.

With the passing of Brig. Gen. George H. Torney, Surgeon General United States Army, the Navy as well as the Army has sustained a distinct loss.

Gen. Torney served as a medical officer of the Navy from 1871 until 1874, when he resigned and was later commissioned in the Medical Corps of the Army.

His attainments in his chosen career very properly led finally to his being placed at the head of his corps. During his incumbency as Surgeon General of the Army, and largely through his unfailing courtesy, exceptional professional accomplishments and modest forcefulness, a spirit of comradeship, mutual respect, and team work has been developed between the medical departments of the two great military arms of the country that is an honor to both services and to military medicine as well, and must lead to higher efficiency in time of national stress, when the medical officers of both corps will be found standing side by side, sharing responsibilities that will be mutual, and directing humane activities of vast proportions.

This great achievement alone justifies comment in the Bulletin, where expression is given of the sentiments of naval medical officers. Gen. Torney has made it possible for this bond of warm comradeship to be a lasting one.

MEDICAL ETHICS IN THE NAVY.

While it must be a source of gratification to the Medical Corps as a whole to realize that the great majority of its officers are actuated by the highest ideals, it must be admitted that within the last few years there appears to have been a growing tendency in the Medical Department of the Navy toward a lack of fraternal good fellowship among medical officers, and what might be considered as a disregard of professional ethics. In some instances these activities have been carried to an extent that has led to embitterment and discontent, and this, unfortunately, not without reason.

Influences of various sorts, and pressure that in some instances could not well be resisted, have been brought to bear upon those

having to do with detailing officers and men under the purview of the Bureau of Medicine and Surgery. In some cases officers who have been previously assigned to duty in which they were giving great satisfaction have been prematurely dislodged, to be replaced by others whose professional qualifications have failed to measure up to the requirements of the situation. On the other hand there have been insistent requests for inconsequential assignments which were wholly disproportionate to the rank of the applicants, who evinced an apparent desire to escape the increased responsibilities which should naturally pertain to seniority.

Personal advancement and selfish ambition have actuated many of these efforts, leaving utterly disregarded the welfare of the service and its personnel. If physicians in a civil community indulged in such activities they would be caused to sever their connections with the medical societies and associations with which they might be affiliated. If these practices are so strongly condemned in civil life, they ought to be doubly discountenanced in a military organization.

The Bureau has endeavored carefully to nominate for assignment officers who in its opinion are specially fitted to meet the requirements of the duties to which they may be ordered; it has aimed to make these assignments with due regard to the rank of the individual concerned, making his responsibilities commensurate therewith, and to see that officers rotate on the various stations, hospitals, and other assignments of the service. On account of the large number of vacancies in the Medical Corps this policy has in many instances failed of accomplishment. It is hoped, however, that certain conditions which have heretofore tended to aggravate or maintain this shortage in personnel may soon be favorably modified and a more normal assignment to duty will then be feasible.

It appears to me that it is timely to call the attention of medical officers to this most improper, growing tendency, and to request that they meet the hardships and trials incident to service with a proper military spirit and loyal bearing toward the best interests of the Navy.—(C. F. STOKES, SURGEON GENERAL, UNITED STATES NAVY.)

MEDICAL OFFICERS IN CIVIL PRACTICE.

In answer to a correspondent, the following list of States which permit medical officers of the United States Army, Navy, and Public Health Service to register without taking the regular State board examination appeared in a recent issue of the Journal of the American Medical Association. This information is important in view of

the widespread belief that a commission in any of the public services confers the right to practice in any State without examination; and on a recent occasion the local authorities refused to accept a death certificate in the case of a man dying in a naval hospital because the medical officer signing the certificate was not licensed in the State.

The following States have taken legislative action in this regard:

1. Alabama grants a certificate to practice to any such officer on the active list, provided he can produce evidence as to his still being in the service.

2. California allows the medical officers of the Army and Navy, whether on the active list, retired or resigned, to practice in that State on a proper showing that they are or were duly commissioned, and on paying a fee of $50.

3. Illinois permits the State board of health to use its discretion in issuing licenses, without requiring an examination, to any physician who is a graduate of a medical college and who has passed an examination before the United States Army, Navy, or Public Health Service.

4. North Dakota allows the experience which anyone has gained in the Army, Navy, or Public Health Service to be given due consideration. The board may in its discretion license such officers without an examination on paying a fee of $25 and producing proper credentials as to their service, etc.

5. Texas permits surgeons and such officers of the United States Army, Navy, or Public Health Service to engage in private practice if a license to do so is first obtained from the board.

The majority of States, it would seem, permit such officers to practice only in the line of their official duties. In a few States the language of the statutes might be construed to imply that Government medical officers may practice without being first licensed. An example of this is Iowa. Its statute says that the act is not to apply to surgeons of the United States Army, Navy, and Public Health Service. It does not say that this is simply in the line of their official duties. It may therefore be inferred that such officers may practice privately. Kentucky, Louisiana, Maryland, Tennessee, and Wisconsin have similar language in their laws. The New York statute exempts such officers "while so commissioned." This would seem to imply that such officers may practice privately while still commissioned.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

A. W. DUNBAR, surgeon, and G. B. CROW, passed assistant surgeon, United States Navy.

LAROQUE, G. P. **Some anatomic and physiologic principles concerning pyloric ulcer.** Annals of Surgery, Sept. 1913.

Many areas demand reconstruction of nomenclature when studied in relation to development, blood and nerve supply, lymphatic drainage, and especially in connection with physiology and pathology. This is especially true of the alimentary canal.

The stomach and that portion of the duodenum as far as the point of entrance of the common duct is functionally sharply deliminated from small intestine and proximal half of the large bowel. This in turn has functions different from the lower bowel. The blood supply is likewise divided, the upper being from the celiac axis, the middle through the superior mesenteric artery, and the lower by the inferior mesenteric.

Physiologically, the foregut prepares the food for digestion; the midgut digests and absorbs, and the hindgut expels the residue.

The first 4 inches of the duodenum, the part above the common duct, is in reality a part of the stomach, and should be so considered because of its similar derivation, blood, lymphatic, and nerve supply. Its structure and diseases are similar.

According to the new nomenclature, the stomach may be divided into two parts, the left or cardiac and right or pyloric. The latter is subdivided into a gastric and duodenal part.

The entire pylorus and duodenum when considered together are grossly arranged in the shape of an S, placed transversely, and allow chyme, bile, and pancreatic fluid to accumulate in the pyloric chamber between the sphincter muscle and the common duct.

The upper margin of the stomach and the first 2 inches of the duodenum are hung from the liver and are freely movable. Beyond the common duct the duodenum is securely fixed behind the peritoneum.

Chronic ulcers of the pyloric region are found just twice as commonly in that portion just distal to the pyloric sphincter as they are in the part of the stomach on the proximal side of the sphincter, 90 per cent of duodenal ulcers being in the first 2 inches of that organ.

There is a definite reason for this. It corresponds to the fundus of the pyloric region, and that portion is notoriously deficient in blood supply as compared with other parts of the organ. Mayo's anemic spot is located here, in the fundus of the pylorus, and studies of the arterial supply verify its less complete circulation.

One can say, in general, that the tendency for infections to occur at the junction of a fixed and movable part is marked, and the area referred to is so situated.

The author believes that ulcers of the pyloric portion of the stomach are often extensions from the duodenum, and that the lesions begin as an inflammatory process on the duodenal side of the sphincter, in the part of least defense, the fundus of the pylorus.

The remainder of the article deals with relative frequency of ulcer in the sexes.—(H. C. CURL, SURGEON, U. S. NAVY.)

COOK, J. B. **Low-priced clinical thermometers, a warning.** Lancet, Oct. 4, 1913.

Three dozen clinical thermometers, costing $2.65 a dozen, were placed in an upright position and completely immersed in warm water. The water was continuously agitated, and at the end of 5 minutes the temperature indicated by each was recorded. The readings varied between 96.8° and 101.6.°

Another group, costing $4.50 a dozen, and guaranteed to a fifth of a degree, was submitted to a similar test. The readings varied from 98° to 105.4°.

A third batch, together with two certified thermometers, was tested. The certified thermometers recorded 98.4°, and the others varied from 95.4° to 97.2°. These were tested again; the certified thermometers registered 105.2° and the others 101° to 103.6°.—L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

DYER, I. **The way to vaccinate.** American Journal Tropical Diseases and Preventive Medicine, December, 1913.

More than mere prejudice has occasioned the objection to vaccination. Formerly it was conducted with virus from human subjects and all kinds of infection resulted.

Some operators are aseptic in their technic, cleaning the area to be vaccinated and using sterile instruments. Most operators, however, once the operation is performed, leave the rest to the vaccinated individual. Following the formation of the vesicle the disagreeable symptoms of itching, rigor, fever, malaise, and marked local reaction appear.

The vaccination ought to stop at the vesicle. The physician should open the vesicle and treat the site antiseptically.

The way to vaccinate should be based on the following technic:

1. Clean the area thoroughly with soap and water; follow with alcohol sponging. Be sure the alcohol dries off well, so as to leave the area aseptic but not antiseptic.

2. Vaccinate by any aseptic method; the writer usually employs the point coming with the glycerinized vaccin and the area is scarified.

3. Cover the area of vaccination at once with sterile cotton and hold in place with collodion. A shield may be used over this dressing to prevent its removal.

4. Conduct the vaccination as you would any other surgical case. Have the patient return on the third, fifth, and seventh days. If there are no symptoms of itching, or of pain, do not remove the dressing until the fifth or seventh day. On the day the dressing is removed, if there is no sign of vesiculation, reapply sterile dressing as before. On the seventh day, look again for the vesicles; if none, repeat dressing. Do this every two days until the tenth or twelfth day. If no vesicles show, revaccinate and proceed as before.

5. If the vesicle shows at any dressing, brush the surface with tincture of iodine or with pure alcohol, then carefully clip the top off of the vesicle with a pair of sterile scissors. Paint the base of the vesicle with a 30 grain to the ounce solution of nitrate of silver, or with pure carbolic acid (followed with alcohol). Put on a sterile dressing or an antiseptic dressing. Change the dressing every two days.

At the end of four or six days, there is a dry crust (not pustulating). Now the patient can take care of the wound with a dressing of ichthyol (20 grains), phenol (10 grains), ointment (oxide of zinc ointment, 1 ounce), changed night and morning.

The evils of vaccination, particularly those incidental conditions following the pustulating arm, are prevented by such a procedure. There can be no impetigos, and erythema multiforme and its congeners can not result from pus absorption.

One point more for reflection, while discussing vaccination:

If vaccinating protects against smallpox, the more complete the vaccination the more complete should be the protection. Vaccination is presumptively protective for seven years. Would it not be better to make sure of complete vaccination by repeatedly vaccinating a successful vaccinee until the vaccin no longer takes? In other words, if a vesicle forms, vaccinate again, at once, and continue vaccinating as long as a vesicle forms until the person is completely immunized against vaccinia.

—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

FRIEDENWALD, J., AND BAETJER, F. H. **The value of X-ray examinations in the diagnosis of ulcer of the stomach and duodenum.** Amer. Jour. Med. Sci., Oct., 1913.

While the X ray affords important additional means of diagnosis in these conditions, it is not believed that a positive diagnosis can be made by it alone.

Twenty cases of undoubted peptic ulcer have been selected for consideration, 10 of duodenal and 10 of gastric ulcer. The diagnosis was confirmed by operation in 6 cases, by typical clinical symptoms in the remaining 14.

The radiographic diagnosis in these 20 cases was made without knowledge of the clinical findings.

It was formerly believed that a diagnosis could be made by showing that the bismuth adhered to the raw ulcerated surface. This is erroneous, as the extreme irritability causes hypermobility, rendering

the adherence of the bismuth to the ulcer almost impossible. Reliance is now placed on the functioning of the stomach and intestines.

The diagnosis of duodenal ulcer is more simple than of gastric ulcer, as the former may practically be ruled out. In duodenal ulcer there is hypermobility of the duodenum and stomach with consequent rapid emptying (in 15 minutes to 1 hour) of the stomach. In gastric ulcer there is at first rapid expulsion of the stomach contents, then a spastic contraction of the pylorus ensues with consequent retention for 2 to 4 hours, according to whether or not the lesion is simple or complicated. In uncomplicated duodenal ulcer there is (*a*) hypermobility, causing a rapid emptying of the stomach of nearly all its contents within one-half hour, with no evidence of hourglass contraction; (*b*) a hypermobility of the duodenum with the constant presence of a "vacant area," probably indicating the site of the lesion.

When adhesions preventing hypermobility are present, the radiographic diagnosis is more difficult, but the presence of marked gastric mobility, with constriction of the duodenum, aids in diagnosis.

In gastric ulcer the diagnosis is more difficult. The normal mobility of the stomach is still an open question, various authorities giving the time for the passage of the bismuth meal as from 2 to 4 hours.

The X ray reveals only the anterior surface and the greater and lesser curvatures of the stomach. An ulcer at the lesser curvature may be shown by repeated examinations by irregularities in the peristaltic waves. If the ulcer happens to be in profile it may show as a vacancy in the bismuth.

Gastric ulcer produces hypermobility of the stomach, but at the same time causes a spasmodic closure of the pylorus, with consequent retention of the bismuth. If the ulcer is just within the pylorus, complete retention for several hours beyond the normal may result.

The X-ray findings of a negative character are valuable.

If the greater part of the bismuth meal is retained over an hour, duodenal ulcer can confidently be ruled out. The negative diagnosis of gastric ulcer is not so distinctive, as retention may be due to simple atony or to prolapse; but even in these cases the retention is not spastic and there is no tendency to hourglass stomach.

The radiographic findings are of value in the determination of the degree of healing of the ulcer. In four to five weeks the patient may appear entirely well, yet the rapid emptying of the stomach shows an irritating lesion to be still present in duodenal ulcer. Later the stomach motility may become normal, showing that healing has occurred.—(A. W. D.)

CROWE, W. H. **The primary cause of rheumatoid arthritis.** Lancet, Nov. 22, 1913.

The author believes that rheumatoid arthritis is caused primarily by a common inhabitant of the skin, the *Micrococcus epidermididis*, and by a particular variety to which he gives the name *Micrococcus deformans*. He would limit the term rheumatoid arthritis to those forms in which there is no demonstrable infection of the joints and which conform more or less strictly to that polyarticular disease chracterized by fusiform swelling and redness of the joints, frequently symmetrical in character, usually commencing in the fingers, and associated with glossiness of the skin and muscular degenerations and contractures. In a series of 26 such cases the above organism was obtained from the urine in 22 cases. Every one of the 26 gave positive complement test with the above organism as antigen. In 14 less severe and doubtful cases complement fixation test was positive in 11 cases and the coccus was cultured in 9 cases. If certain cases of neuritis are included, and the author believes that the disorder is produced mainly by the action of the germ on the nervous system, the total number of cases becomes 48, with positive complement fixation tests in nearly 94 per cent. A number of cases suffering from other diseases were tested as controls, and the complement fixation tests were uniformly negative. Results are not detailed, but it is stated that cases treated with a vaccine made from this organism were apparently markedly benefited, and after such treatment the complement fixation test was negative.—(G. B. C.)

PARKINSON, J., AND ROWLANDS, R. A. **Strychnine in heart failure.** Quar. Jour. Med., Oct., 1913.

Strychnine is widely employed as a rapid heart stimulant.

This inquiry was undertaken to determine the immediate effect of strychnine in severe cases of heart failure. The 50 patients treated were admitted to the London Hospital in 1912. Only such cases were included as showed symptoms and signs of severe cardiac failure with or without valvular disease. Most of the cases studied showed orthopnea and edema of the legs; all had shortness of breath. Cardiac disease secondary to pulmonary or renal disease was excluded. Pyrexial cases were also excluded. The cases were divided into two nearly equal groups; in the first were placed cases with regular rhythm, in the second those with auricular fibrillation. McKenzie has shown how differently these two groups react to digitalis.

On the day of admission each patient was given a single subcutaneous dose of one-fifteenth grain of strychnine sulphate. The pulse and respiratory rate were recorded by the McKenzie ink polygraph, and the systolic blood pressure by Leonard Hill's sphygmomanometer. The readings were made at 5-minute intervals, beginning 10 minutes

before and continuing for 1 hour after the administration of the strychnine. Before each experiment the patient was kept at rest in bed for from 3 to 8 hours, and pains were taken to reduce as far as possible the psychical effect of the experiment. The last five cases in each group were used as controls. On the day of admission the procedure in these cases was exactly like that in the other cases except that 15 minims of water replaced the strychnine solution. On the following day strychnine was given as in the test cases.

The authors' conclusions are quoted: "We found no evidence that the subcutaneous injection of a full dose of strychnine in cases of heart failure with a regular rhythm produces any change in the blood pressure, rate of pulse, rate of respiration, or general symptoms within the hour following its administration. In cases with auricular fibrillation strychnine produced no change in the rate or irregularity of the pulse, rate of respiration, or general symptoms during the same period.

"We conclude that strychnine has no effect which justifies its employment as a rapid cardiac stimulant in cases of heart failure."—(G. B. C.)

BARKER, L. F., AND GIBBS, JAMES H. **On the treatment of leukemia with benzol.** Bull. Johns Hopkins Hospital, Dec., 1913.

The authors discuss the 18 previously reported cases of leukemia treated with benzol and add another case to the literature.

Santesson in 1897 and Selling in 1910 recorded their observations upon cases of benzol poisoning occurring in industrial occupations, and followed their clinical observations by experimental production of benzol poisoning in animals.

In July, 1912, von Koranyi reported the first case of splenomyelogenous leukemia treated with benzol. He was led to this treatment through the experiments of Selling, who had found that in animals benzol in proper dosage produced an inhibition of the white blood corpuscle forming organs and a neutral or stimulant action upon the production of red cells and hemoglobin. Prolonged exhibition of the drug produced severe secondary anemia. Autopsies on these experimental animals confirmed this somewhat selective action, the bone marrow showing great diminution in the polymorphonuclear cells and degenerative changes in the myelocytes, the red cells remaining practically unchanged. Selling's animal experiments had been preceded by his observations upon three cases of poisoning resulting from prolonged exposure to the fumes of benzol. These cases had shown pallor, purpuric spots, hemorrhages in the retina, and marked secondary anemia and leukopenia. Differential counts showed a relatively marked decrease in the large mononuclears while the lymphocytes were relatively increased. Two of the cases died.

At autopsy the bone marrow was found to be aplastic, and in one case the spleen showed areas of hyaline necrosis affecting the malpighian corpuscles.

Koranyi's case shows the apparently typical response to this treatment. His patient was a woman, 32 years of age, who entered his clinic January 30, 1912, complaining of weakness and of enlargement of the abdomen. The spleen extended below the umbilicus. The red cells numbered 3,100,000 and the white cells 220,000 with 16 per cent myelocytes. On February 16 benzol was begun in doses of 3 gms. daily, and on March 1 increased to 4 gms. daily. Treatment was discontinued May 15. The white cell counts were: February 23, 173,000; March 1, 198,000; March 22, 120,000; April 4, 65,000; April 23, 19,600; May 12, 12,000; May 15, 8,000 The red cells had increased to 4,000,000, the spleen was reduced in size, and the patient's general condition was markedly improved. The white cell count had not changed 6 weeks after treatment was stopped.

Since Koranyi's report Kiralyfi, Billings, and others have reported a total of 18 cases as follows: Splenomyelogenous leukemia, 13; lymphatic leukemia, 3; pseudoleukemia, 1; polycythemia with splenic tumor, 1. In all these cases of leukemia treated with benzol the white cells fell to normal, or practically normal, and remained so for a considerable length of time after treatment was stopped. A primary rise in the number of white cells soon after treatment is started seems characteristic. In the cases of splenomyelogenous leukemia the percentage of myelocytes was greatly reduced, but they completely disappeared in only one case. In the cases of lymphatic leukemia the white cells fell to practically normal, but the differential count remained unchanged. In the case of polycythemia the red cells were reduced from 9,000,000 to 6,000,000.

The case reported by the authors accords with previous reports. Benzol was started in doses of 2 gms. daily and increased 1 gm. daily until the dosage reached 5 gms. Treatment extended over a period of about 11 weeks. The white blood cells fell from 191,000 to normal, the myelocytes dropped from 26 per cent to 4 per cent, the red cells were increased from 3,600,000 to 5,000,000, the hemoglobin rose from 65 per cent to 82 per cent, and the patient's general condition showed definite improvement. When discharged, 9 weeks after benzol treatment was discontinued, the cell counts remained practically the same as at the end of treatment. This patient had previously received Fowler's solution for a short time and had received a single exposure to X-rays.

The authors conclude that accessory measures such as X-rays, arsenic, thorium X, and radium may have a possible value in this treatment, but that benzol is efficacious in reducing the white blood cells and in producing subjective improvement of the patients. They

emphasize the fact that benzol possesses dangerous toxic properties, and they believe that cases should only be treated in hospitals in order that the dosage can be properly controlled and manifestations of poisoning detected early. "The ultimate place of benzol in the treatment of leukemia, polycythemia, and Hodgkin's disease can be determined only through further studies which include careful clinical observations."—(G. B. C.)

SURGERY.

H. C. CURL, surgeon, and R. A. WARNER, passed assistant surgeon, United States Navy.

SKILLERN, P. G. **Surgical aspects of furuncles and carbuncles.** Pa. Med. Jour., July, 1913.

A furuncle follows infection of a hair follicle or sebaceous gland, usually by *Staphylococcus pyogenes aureus;* a barrier of leucocytes and serum is thrown about the bacteria and eventually they are thrown out as the core. With the removal of the core the entire pathological process is removed and the protective wall rapidly subsides. To excise this highly beneficial zone is meddlesome surgery, as it transplants virulent organisms, which had been walled off, into the tissues. Incision, then, is irrational in the early days when the boil is hard; but if the boil has not been treated and reaches the stage of a subcuticular abscess, incision is indicated to release the core which is now surrounded by a lake of pus.

To treat an early, hard boil on the neck, for instance, first shave with a sharp razor a wide area around the boil; bathe the skin area thoroughly with benzin, and then with 95 per cent alcohol; follow by painting with tincture of iodine or 3 per cent alcoholic solution of picric acid. Now scratch off the point of the vesicle, apply a Bier cup, and allow gentle suction for 3 minutes; repeat in 4 hours. This removes some of the infected fluids and bathes the boil with fresh blood. Dress with gauze saturated with Wright's solution, which consists of sodium citrate 1 per cent and sodium chloride 2 per cent, and instruct the patient to keep the dressing wet with the solution. The core is expelled in 1 to 4 days and healing is rapid, with a scarcely visible scar.

If the boil has been squeezed or the center orifice does not permit drainage, the surrounding tissue becomes involved and a fluctuating subcuticular abscess follows. This is the only indication for incising a boil, and here we have not a boil, but an abscess.

To prevent recurrence of furuncles, an autogenous vaccine should be administered.

The progress of a carbuncle may be checked early by removal, under local anesthesia, of any boil about the lower part of the neck

which appears in a person past middle age or which by its depth and rapidity of extension threatens to become a carbuncle. Excision of the carbuncle is the method of choice, no matter what the stage; after excision cauterize with the actual cautery and swab with pure phenol.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

WILDE, A. G., U. S. A. **Iodine idiosyncrasy.** The Military Surgeon, Sept., 1913.

The therapeutic use of iodine is becoming so general that its occasional disagreeable manifestations should be borne in mind. Local application of tincture of iodine may cause a deep-seated dermatitis beneath the surface where it is painted and rarely a milder form spreading widely from the place of application.

When the application of iodine is followed by a dressing of bichloride of mercury, the irritating biniodide of mercury is formed and is liable to cause dermatitis.

Two cases of iodine idiosyncrasy are described:

Case 1.—After circumcision iodoform gauze was applied to the wound and considerable enlargement of the thyroid followed. The gauze was removed and within a day the swelling subsided; it returned when the iodoform gauze was replaced. By way of experiment a spot on his back was scarified and an iodoform gauze dressing applied; thyroid enlargement followed and subsided after removal of the dressing.

Case 2.—Iodine was applied as an antiseptic to a slight scratch; on the following day the area of application was raised, reddened, and indurated, having an appearance suggestive of ringworm. Iodine was again applied, and on the next day there was superficial sloughing with a copious serous discharge; exfoliation followed and a few pustules which showed no organisms, but great numbers of polymorphonuclear leucocytes. Healing was sluggish.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

SCHLEY, W. S. **Rectus transplantation for deficiency of internal oblique muscle, in certain cases of inguinal hernia.** Annals of Surgery, October, 1913.

The author speaks of the cases of inguinal hernia in which the internal oblique is markedly deficient. The transversalis fascia at the base of Hesselbach's triangle is also frequently found to be very thin, so much so that when the fibers of the external oblique are cut three or four fingers can be thrust into the abdomen. In about 7 per cent (Bloodgood's figures) the transplantation of the rectus is most desirable and furnishes the best method of strengthening the weak wall.

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We have the choice of a number of operative procedures, depending upon the anatomical condition and based upon or combined with the Bassini operation.

In the presence of a good internal oblique muscle, its internal attachment is weakened if the rectus sheath is opened anteriorly.

In deficiency of the internal oblique, rectus transplantation (as an additional Bassini) is of assistance both in the direct and indirect hernia, and the sheath may be opened anteriorly.

Ordinarily, however, it is better to open the sheath from behind the attachment of the internal oblique and transversalis aponeurosis. Open the rectus sheath for 3 inches just below (behind) the insertion of the aponeurosis of the remaining good oblique. The muscle is loosened from its sheath and drawn down to the thoroughly cleansed shelving edge of Poupart's ligament by four No. 2 or No. 3 14-day chromic sutures. The cord then rests upon this bed. The outer half of the external oblique aponeurosis is sutured to the rectus sheath. This overlaps the line of union of muscle to Poupart's ligament and closes over the rectus muscle. The inner half of the external oblique aponeurosis is drawn over the line of union (of the outer half with the rectus sheath) with a few mattress sutures.

Rest in bed for 20 or 21 days is advocated. The author's results have been excellent.—(H. C. C.)

GIBBON, J. H. **The technic of nephro- pyelo- and ureterolithotomy.** Annals of Surgery, August, 1913.

After reviewing the history of these operations the author says that "the incision for the exposure of the kidney will probably never become uniform. * * * The straight incision along the edge of the erector spinæ with oblique extension along the iliac crest is the most generally employed."

Dr. Mayo advises free exposure of the twelfth rib and division of the quadratus and lateral arcuate ligaments which bind the rib to the transverse process of the first lumbar vertebra.

Injury of the pleura is not serious if discovered at the time and repaired. A more serious mistake is division of and failure to suture the iliohypogastric and ilioinguinal nerves.

Introduction of the hand and careful palpation of the kidney should be done before delivery.

Needling is unsatisfactory and dangerous.

The X-ray is of great value and at operation each stone, demonstrated by a good radiograph, should be accounted for and removed before closure as carefully as sponges or instruments.

Three procedures are open to us for removal of stone in the kidney or its pelvis: (*a*) Pyelotomy, (*b*) splitting of kidney over area of fewest vessels, and (*c*) incision directly over the stone.

Where careful suture is done, opening the pelvis is the operation of choice in most cases, care being used in incising the fatty, overlying covering before opening and its careful subsequent closure.

If the kidney is to be opened along the back, the pedicle must be firmly compressed between thumb and finger of the operator's left hand until work is done, sutures placed and tied. This is much better than using a clamp; less likely to injure the vessels.

Use only catgut about the kidney. Silk has no place in renal or ureteral surgery.

Incision directly over the stone is accurate and does not damage the kidney as extensively as trying to remove several stones through one opening, and is advised whenever the location of the stone or stones can be determined accurately beforehand.

For drainage, use only rubber-covered gauze, or, if no pus is present, folded rubber only.

The operation for ureterolithotomy differs materially with the situation of the stone. A common location is within an inch or two of the kidney, and they can then be removed through the kidney incision, as used for other kidney work. They often lodge between the iliac vessels and the bladder and are approached by four routes—the sacral, the intraperitoneal, the extraperitoneal, and the combined intra and extraperitoneal.

The sacral route is through an incision along sacrum and coccyx, with possibly an osteoplastic flap. It is not much used.

The intraperitoneal or transperitoneal removal of ureteral stones, though easiest of all the methods, has quite obvious objections and is not safe; it is to be used only when necessary.

The extraperitoneal operation, done usually through a muscle-splitting incision parallel with Poupart's ligament, is undoubtedly ideal, but often the approach is difficult because the ureter is raised with the peritoneum as it is separated from the posterior abdominal wall. When a fair-sized stone is lodged below the iliac vessels, this operation is comparatively easy.

The combined intra and extraperitoneal method meets most of the requirements best and is advocated by the author, and has been used in 14 of his cases with success.

An advantage of this method is that the entire ureter on the suspected side and a large part of the ureter on the opposite side may be explored and the stone located through the transperitoneal incision and then the stone removed through the extraperitoneal incision.

With the hand in the abdominal incision the stone can be more readily passed up into a healthy portion of the ureter, and with care the danger of infecting the peritoneum in this combined method is practically nothing.

The author locates the stone through the peritoneal incision, then exposes it by the extraperitoneal incision and fixes it for incision of the ureter. At this point the finger is removed from the abdominal cavity and is not returned. The drain, consisting of folded rubber, is brought out through the extraperitoneal wound as far from the peritoneal wound as possible.

Operate for stone in kidney or ureter before the kidney is seriously damaged or turned into a pus pocket.—(H. C. C.)

HULL, A. J., MAJOR, R. A. M. C. **Recurrence of inguinal hernia.** Annals of Surg., Vol. LVIII, No. 4, Oct., 1913.

Of 57 cases of recurrent inguinal hernia observed by the author, 45 had had performed an operation for cure as follows: (*a*) inguinal canal opened; (*b*) sac ligated at neck; (*c*) conjoined tendon sutured to Poupart's ligament over the cord. Recurrence is ascribed, after this type of operation, to the formation of a tent-like space by the stretching of the conjoined tendon over the cord without any narrowing of the internal ring. The hernia appears to the inner side of the ring; hernia to the outer side does not occur.

Seven cases operated upon in the following manner occurred in the group: (*a*) Inguinal canal opened; (*b*) sac ligated at neck; (*c*) conjoined tendon sutured to Poupart's ligament under the cord. Here the internal ring is efficiently narrowed and recurrence is to the outer side of the ring from failure to reenforce at that point.

The remaining 5 cases followed (*a*) simple ligation of the sac alone; (*b*) ligation of the sac with displacement of the stump; (*c*) ligation of the sac not sufficiently high up, and (*d*) cases treated during childhood by truss. Mode of recurrence is obvious.

The author strongly recommends in the performance of any type of modern operation for the cure of hernia that the ligated stump of the sac be displaced, but emphasizes that the displacement be directly upward and certainly not outward.

From a consideration of the mode of recurrence in the group the following points are developed to be met in an ideal operation for permanent cure:

1. Transposition of the neck of the sac.
2. Constriction of the internal ring.
3. Strengthening of the weak area to the inner side of the ring.
4. Obtaining adequate pressure over the internal ring.
5. Strengthening the weak area to the outer side of the ring.

To meet these points the following operation is described: The external oblique is opened from external ring to well above the internal. The coverings of the cord are lifted between forceps and divided by a knife the edge of which is lateralized. The sac is care-

fully isolated by dry gauze dissection, ligated high, and distal portion removed. The ligatures are left long, and are then threaded on needles. The needle, protected by the finger, is passed through the internal ring and the point thrust through all the layers of the abdominal wall except the skin at a point 1½ inches directly upward. The second ligature end is treated in the same way and the two tied together. The cord is then lifted. The two muscles forming the conjoined tendon are separated and the transversalis is sutured under the cord to Poupart's ligament. At this point the cord is dropped, the procedure having constricted the internal ring and strengthened the weak area to its inner side. The internal oblique is then sutured over the cord and the balance of the operation completed. By bringing the internal oblique over the cord (the area to the outer side of the ring left weak occasionally by the Bassini type) muscle pressure over the ring is obtained and the pressure of the transversalis which now forms the floor is reenforced by the internal oblique, the cord passing between the two so that hernia along it can not occur.

Fishing gut in place of kangaroo tendon, the author states, gives better results, and no ill effects have been noted from the hard non-absorbable material in his experience.—(R. A. W.)

HYGIENE AND SANITATION.

C. N. Fiske, surgeon, and R. C. Ransdell, passed assistant surgeon, United States Navy.

Jordan, E. O., and Carlson, A. J. **Ozone: its bactericidal, physiologic, and deodorizing action.** Jour. Amer. Med. Assoc., Vol. LXI, 1913, pp. 1007-1012.

All of the experiments were made in a small air-tight room of 26 cubic meters capacity. The ozone was generated by an ozonator supplied by the General Electric Co. and delivering ozone in two concentrations, a lower of 4 to 5 parts and an upper of 10 to 11 parts of ozone per million.

The ozonized air was thoroughly examined for oxides of nitrogen after the machine had been in use for 5 weeks. The results were negative, thus indicating that ill effects of the ozonized air could not be attributed to such contamination.

Bactericidal experiments: The results show that ozone ranging from 3 to 4.6 parts per million did not have a surely germicidal action on the pathogenic bacteria studied, either in the dry or moist condition. Some bacteria are undoubtedly killed by ozone if they are in contact for several hours with a current of ozone of high concentration; but this is of little or no hygienic importance, for human beings are injuriously affected by quantities of ozone far less than are necessary to bring about any bactericidal effect. There is no evidence for sup-

posing that a quantity of ozone that can be tolerated by man has any germicidal action.

Physiologic experiments: Tests were made with both animals and men. Tracheotomy was performed with some animals and the ozone introduced through a tracheal cannula. Three-fourths of the ozone in the inspired air was decomposed by the mucous membrane at the upper end of the respiratory passages.

Cardiac and vasomotor effects in man were studied, the subjects sitting a few inches away from and facing the ozonator. The results were uniform in showing an increase in the amplitude of the heart beat, but there was no constant change in pulse rate or blood pressure. Drowsiness and frontal headache were, however, marked features. In some cases the headache persisted from 2 to 6 hours, in other cases coming on from 2 to 3 hours after exposure to the ozone.

Deodorizing experiments: Ammonia vapor, hydrogen sulphide, human feces, and decomposed urine were studied. With the exception of ammonia and oil of cloves, all odors were masked by ozone below a concentration of one to a million. When the ozonators operated just long enough to cause complete masking by the ozone, there was no appreciable destruction of the odorous substances. Strong percentages of ozone—i. e., 2 to 5 parts per million—caused some actual destruction of the odors of feces, stale urine, and decomposing meat, but such concentrations are beyond human tolerance. The masking of odors is a result of the intensive odor of the ozone and possibly from fatigue or anesthesia of the olfactory epithelium.—(E. W. BROWN, PASSED ASSISTANT SURGEON, U. S. NAVY.)

SAWYER, W. A., BECKWITH, H. C., AND SKOLFIELD, E. Y. **The alleged purification of air by the ozone machine.** Jour. Amer. Med. Assoc., Vol. LXI, 1913, pp. 1013–1015.

The plan of the investigation was to show the relative killing power of ozone on animals and bacteria. No attempt was made to measure the quantities of ozone, nitrogen oxides, or other gases. The experiments were carried on in a tight wooden cabinet with a capacity of 1 cubic meter. Guinea pigs were used as subjects and were placed in a small wire cage where they could be seen through the glass doors of the cabinet. The bacterial cultures used were grown for a day on meat extract. Sterile glass rods were dipped into the culture and the broth was dried on them in an almost invisible film. These rods were fixed in large corks and were inserted into the cabinet through holes drilled near the top. After exposure to the ozone, the rods were withdrawn and the ends were dipped into tubes of broth. After 48 hours of incubation the clouded cultures were tested to ascertain whether or not the growth was due to the organism originally placed on the rod.

The conclusions were as follows: The gaseous products of the two well-known ozone machines examined were irritating to the respiratory tract and, in considerable concentration, produced edema of the lungs and death in guinea pigs. A concentration, which was high enough to kill in the course of several hours typhoid bacilli, staphylococci, and streptococci dried on glass rods, killed guinea pigs in a shorter time, therefore ozone has no value as a bactericide in breathable air. Ozone machines produce gases which mask disagreeable odors of moderate strength, in this way concealing faults in ventilation while not correcting them. It therefore can not be properly classed as a hygienic device.—(E. W. BROWN, PASSED ASSISTANT SURGEON, U. S. NAVY.)

STEELE, W. K., MAJOR, R. A. M. C. **The prevention of dental caries.** Jour. R. A. M. C., Vol. XXI, No. 3, Sept., 1913.

The imperial exchequer has made a grant to the education department for reimbursement to local authorities for expenditures in the dental treatment of school children for whose health county councils are now responsible.

Steele urges that the Government assume the care and preservation of four teeth in each boy, viz, the first or 6-year lower molars and the second or 12-year lower molars; these would be attended to at ages of 7 or 8 and 13 years, respectively, when decay could be stopped in 20 minutes. "A year later it may be a 2-hour job. In dentistry time is money."

He arrives at this conclusion from study of Army recruit statistics and personal examination of school children and applicants for the special reserve. In 1909, 15,567 applicants for the Army were rejected on account of physical disability. Of these 2,760 for loss or decay of many teeth and 2,931 for underchest development, which "means malnutrition, probably largely due to defective teeth." Of those accepted 86 had to be discharged within three months on account of defective teeth. In 600 school children the upper molars were found to be fairly sound, while those of "the lower jaw commenced to go almost as soon as they were erupted." Of 115 candidates for the reserve between 17 and 18 years of age, 10 had sound teeth, 12 had teeth capable of conservation, and in 72 the first and second lower molars were deficient or hopelessly decayed. But 12 had decay of upper molars, "and in only 9 were the teeth altogether bad." The expense involved is appreciated, but whole-time dentists could perform the work following systematic tours of inspection, and the greater expense of local and indifferent contract dentists avoided.

The author appeals for the question to be tackled in "an imperial and patriotic spirit," for "on the health of the children depends the very existence of England as a first-rate power."—(C. N. F.)

MUNDAY, K. C., FLEET SURGEON, R. N. **Gun-running operations in the Persian Gulf in 1909 and 1910.** Jour. R. A. M. C., Vol. XXI, No. 2, Aug., 1913.

Among the many interesting observations in this account is found one of importance to hygiene of the feet in marching. The force concerned "marched 53 miles in 54 hours over very heavy ground, mostly loose sand, with here and there rocky patches," with no sickness or any man falling out.

All the sailors had blistered feet after first 10 miles, in spite of soapy water soaks and the use of Condy's fluid, clean soaped socks, and oiled shoes, except one man who, having lost his shoes, marched in his stocking feet for 15 miles without acquiring blisters or sore feet. A month later a similar force marched 16 miles without acquiring blisters; this time a somewhat different prophylactic treatment was given:

> Eight hours before landing all the men soaked their feet in Condy's fluid and anointed the insides of their socks with a thin layer of boracic ointment. No man had on his return the slightest sign of sore feet, although after marching the first 10 miles on the previous expedition all the men except one had developed blistered feet, in spite of the fact that their socks were carefully soaped beforehand. None of the men in this second expedition had taken part in the first or had any opportunity of landing since January 21, or even of wearing their boots on board.—(C. N. F.)

HERMS, W. B., AND NELSON, Y. **The croton bug (ectobia germanica) as a factor in bacterial dissemination.** Amer. Jour. Public Health, Vol. iii, No. 9, Sept., 1913.

By laboratory experiments it is demonstrated that:

1. The croton bug (*Ectobia germanica*) feeds by preference upon the food of man.
2. The croton bug is commonly found in situations where infective sputum or excrement exist.
3. The croton bug is structurally equipped to collect filth and bacteria upon its appendages, though this equipment is not as effective as in the house fly.
4. The croton bug has the ability to pick up specific bacteria on its feet and mouthparts and deposit these on human food; e. g., sugar.
5. The bacterial population of a single croton bug was found to be a minimum of 13,370 bacteria.
6. The croton bug carries more bacteria upon its hind pair of legs than on its middle and fore legs combined.
7. The croton bug is normally nocturnal in habit, though it may be active during the day, and is more or less omniverous in food habit.
8. The eggs of the roach are laid in pairs (13 pairs usually) in an egg case which is carried for several months by the female.

9. The young roaches require evidently not less than 1 year to mature and probably more.

10. The usual trapping methods are not very effective in the control of the croton bug. Sweet mixtures containing borax or flour and plaster of Paris with water available are recommended as good remedies.

These observations confirm and are elaborated by the work of Longfellow (Ibid., Vol. III, No. 1, Jan., 1913), who demonstrated that pathogenic bacteria were harbored and kept virulent by roaches found in nature in domestic life.—(C. N. F.)

GRUBBS, S. B., AND HOLSENDORF, B. E. **Fumigation of vessels for the destruction of rats.** Public Health Reports, June 20, 1913.

This is a very interesting article which should somewhat disturb the complacency of those quarantine officers who fumigate in the usual routine way with sulphur and regard their duty done. Naval medical officers, in time of war or peace, will occasionally be called upon for such service, and the author's extract from the Report of the Board of Health on Plague in New South Wales, 1907, on the Adelaide Steamship Co.'s *Innamincka*, should be somewhat enlightening. Five complete routine fumigations were carried out in a period of 10 days before complete extermination of rats occurred. One thousand and seventy-seven rats were found. The author's results in Porto Rico were of the same tenor; when a moderately protected hiding place is left, such as pipe covering, piles of dunnage, wooden sheathing to sides, etc., some rats will escape. Disinfection of holds without simultaneous action in all spaces can only be regarded as a disinfection of the cargo. The author gives results of experimental disinfection ashore and afloat, and recommends 4.5 per cent gas (5 pounds of sulphur per 1,000 cubic feet) for seven hours in living quarters and engine rooms, and 3 per cent gas in holds and similar spaces with an exposure of at least 12 hours.—(R. C. R.)

EYSELL, A. **Improved moist chamber for mosquito breeding.** Arch. f. Sch. u. Trop. Hyg., Bd. 17, Hft. 20, 1913.

This consists of a small fruit jar with a slanting surface of clean white sterilized sand in the bottom, partially covered with water. The top is closed in by netting containing a wad of cotton for a resting place. The whole stands in a pan of water and has a larger fruit jar inverted over it. The impregnated female dies soon after laying her eggs and is easily removed.—(R. C. R.)

HOWARD-JONES, J. **The necessity for international reforms in the sanitation of crew spaces on merchant vessels.** Newport, Mon. Lancet, Sept. 20, 1913.

Keen competition in the cargo-carrying trade makes toward restriction in amount of crew space and the comforts or even the necessities therein. An international congress on this subject is appropriate owing to the cosmopolitan character of the average crew. The lack of seats, tables, or lockers; no mess room, no lining to the outer skin of the ship, no bathrooms, poor lighting and ventilation, bad drinking water, and leakage into living spaces, are all found commonly by inspecting officers. The overcrowding has been found to give even as low as 72 cubic feet per man. Ideal conditions for propagation of tuberculosis are generally present. Thirty-nine out of 165 cases of sickness coming into one port in 1912 were phthisis. A ventilator is required by the board of trade, says Dr. Williams, for the port of London; but this is often directly over a bunk or is stopped up from below. Poor lighting is quite common. The standard for the Board of Trade of Liverpool is ability to read an ordinary newspaper in any part when the ship is new and the paint clean. Bunks frequently obscure the light from portholes.

Sanitary facilities are often hardly decent. During the years 1898 to 1908 the following is the average of insanitary vessels at Newport:

Country.	Average per cent insanitary.	Country.	Average per cent insanitary.
Denmark	10.5	France	18.5
Norway	11.11	Russia	19.5
Germany	11.27	Belgium	20.9
Sweden	11.4	Portugal	22.59
Austria	13.27	Spain	26.2
Great Britain	13.99	Greece	29.8
Holland	18.3	Italy	37.7

—(R. C. R.)

TROPICAL MEDICINE.

E. R. STITT, medical inspector, United States Navy.

SMITH, A. J., LYNCH, R. M., RIVAS, D. **The transmissibility of the lepra baccillus by the bite of the bedbug.** Amer. Jour. Med. Sci., Nov., 1913.

A prefatory paragraph states that it was intended to delay publication of this article until a more thorough study of the strain of organisms employed could be made. An article by Kerr (Naval Med. Bull., 1912, No. III, p. 316), implicating the bedbug as a conveyor of leprosy, led the authors to publish at this time.

Decision as to the value of these studies must be delayed because of the uncertainty prevailing in respect to the specific status of various cultures regarded in different laboratories as *Bacillus lepræ.*

Recent workers have uniformly obtained organisms which in the tube appear as yellow or orange chromogens which are acid fast, vary in morphology from a bacillary to a coccoid form and grow readily on culture media, such as putrid fish, in which advanced protein cleavage products are present. Doubt as to the real status of the growths and the purity of the cultures has arisen from the uncertainty of experimental inoculation and the presence of organisms which usually have been considered as contaminations or symbiotic organisms.

The question is considered whether the causative organism of leprosy is not pleomorphic, possibly a streptothrix, with varying phases which include the supposed cultural contaminations. The writers incline to credit this suggested pleomorphism.

Arguments for and against transmission of this disease by contact and by inhalation are considered. That transmission in some such manner may occur has not been disproved, but there is little evidence that such transmission is the rule.

Certain recent observations tend to support the contention of Sir Jonathan Hutchinson that the disease is acquired by eating fish. Cold-blooded animals, such as fish and turtles, may represent the true habitat of the lepra bacillus, man being relatively or absolutely resistant and requiring excessive dosage or predisposition to become infected.

Citrated dog's blood mixed with lepra bacilli was placed in a shallow dish and rat skin placed over it in direct contact with the blood; the bugs were placed on the skin under inverted test tubes and the whole kept warm in the incubator. Smears made from the excised alimentary canals of unexposed bugs were invariably free from acid-fast bacilli. Smears made from the bugs immediately after feeding showed a few bacilli, and from observations made on over 100 infected bugs there is no doubt that for a time the bacilli increase in size and numbers within the bugs. After a period of 14 to 30 days the bacilli disappear from the bugs, some being discharged with the fecal matter and others being broken up into fine acid-fast granules.

Bedbugs were fed upon lepers, and acid-fast organisms of the usual human type of lepra bacilli were found in a number of the bugs, but not in all. From further study of these human cases the writers are persuaded of the existence in lepers of a true lepra bacillemia, the bacilli being obtained both by culture and by staining in blood removed directly from the veins without contact with the skin lesions. (Crow, "Acid-fast bacilli in the circulating blood of lepers," Naval Med. Bull., 1910, No. 2, p. 143, and 1912, No. 1, p. 25—L. W. J.) This belief is further urged by the fact that lepers constantly show the organisms in the various secretions and in the internal organs as well as in the dermal lesions.

An effort was made to determine whether in biting there occurs a discharge of lepra bacilli into the wound along with the mouth secretions of the bug. In 5 of a group of 11 fresh smears of the crushed skin incised from the site of puncture in guinea pigs, small bunches of acid-fast bacilli were found. In 4 of the 5 the finding was controlled by the absence of such bacilli in smears similarly made from tissue in the immediate vicinity of the bite.

The conclusions are summarized as follows:

1. Bedbugs can be induced by methods detailed to take up lepra bacilli with blood to which the bacilli have been added.

2. Within the bugs for a time the bacilli increase in size and apparently in numbers, but eventually disappear, partly by discharge with fecal matter, partly also by disintegration within the bedbugs.

3. Within the bugs thus infected the writers have found the bacilli in the glands as well as in the alimentary canal.

4. Bedbugs acquire lepra bacilli also with blood taken from human leprous subjects, but not invariably.

5. Bedbugs infected in the laboratory, and presumably more certainly and more heavily infected than those which are infected from human beings, may transmit the bacilli by route of the sucking apparatus to the skin of the animal bitten.

6. Whether thus the disease is transmitted in nature—that is, whether the organisms are unchanged and of sufficient virulence to induce leprosy—remains to be proved; and the writers would here also indicate their belief that if bedbugs really do transmit the disease, as they suggest, they are probably only one of a number of possible conveyors, other types of biting and sucking insects being equally open to suspicion (particularly those which regurgitate in biting).—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

ROGERS, W. **A note on a case of loa loa.** Annals of Tropical Medicine and Parasitology, Nov., 1913.

In this article a description of the author's own case is given. He notes that he had fugitive swellings about the joints which were painless but associated with stiffness. The condition was diagnosed as rheumatism, cellulitis, erythema nodosum, and angioneurotic edema.

He first recognized the nature of his trouble when he felt *Filaria loa* crossing the bridge of his nose. When the parasite appeared about the face he would feel a tender spot and later on, in an hour or two, the spot would be swollen, but the parasite had by then passed upward to the eye, leaving an edematous track.

When the parasite migrated to the face it invariably attacked the eye, moving around either under the ocular conjunctiva or in the lid.

There might be no indications of the presence of the parasite for weeks, when he might wake up with a swelling of the arm or leg. Two worms have been removed at different times. He notes that, although he made numerous blood examinations, he never found anything of interest.—(E. R. S.)

NEWHAM, H. B. **Cases of syphilitic pyrexia simulating tropical fevers.** Jour. Lond. Sch. of Trop. Med., Nov., 1913.

The author notes that the Wassermann reaction may be given by other diseases than syphilis and that salvarsan is specific for other spirochætal infections.

Attention is called to the possibility of confusing syphilis and amebiasis.

It is considered that treatment by potassium iodide will best differentiate fevers incident to syphilis and those occurring in the course of various tropical diseases.

Four cases are reported where patients admitted to the Albert Dock Hospital were thought to be suffering from tropical fevers; but various laboratory examinations proving negative for malaria, amebiasis, intestinal parasites, etc., the patients were given potassium iodide, this treatment causing the temperature to become normal after a few days. The large mononuclears in these cases gave a percentage of 15, 14, 14, and 8, respectively.

One case had had fever and marked sweating, but no rigors for about three months, with loss of considerable weight. Vigorous quinine treatment had no effect.

Another patient had had pains in the region of the liver, radiating to right shoulder, about 2 months previous to his admission to hospital. He also had a history of dysentery. This case recovered completely under potassium iodide.—(E. R. S.)

STRONG, R. P., AND COLLEAGUES OF EXPEDITION TO SOUTH AMERICA FROM THE DEPARTMENT OF TROPICAL MEDICINE, HARVARD UNIVERSITY. **Verruga Peruviana, oroya fever and uta.** Jour. Amer. Med. Assoc., Nov. 8, 1913.

It is remarkable that this commission should have accomplished so much in the way of elucidating certain problems in connection with these three tropical diseases and in a comparatively short time.

It is noted that from the time Carrion, a medical student in Lima, inoculated himself with blood from a verruga tumor and died from oroya fever about 1 month later, it was concluded that verruga and oroya fever were stages of the same disease.

When the commission arrived at Lima, Peru, the view of the medical profession was that verruga began as a fever, lasting 15 to 30

days, with profound anemia, prostration, and a high mortality. If the patient did not die an eruptive or verruga stage set in. In 1905 Barton described elements of bacillary morphology as present in the red cells of two persons sick with oroya fever.

Other investigators studied these bodies, but there was no agreement as to their nature, whether degenerative products, protozoa, or bacteria.

The commission found in the blood of oroya fever cases rod-shaped forms in the red cells, varying from 1 to 2 microns in length, the red cell containing from 1 to 30 of these elements.

Intravenous inoculation of blood containing these elements into monkeys and rabbits was negative in result. These organisms were considered as intermediate between bacteria and protozoa. They are considered as closely related to Grahamella and the commission has proposed the name *Bartonia bacilliformis.*

As a type species the parasite of oroya fever is thus described:

Bartonia bacilliformis. Gen. et. sp. nov. Parasites consisting of rounded or oval forms or of slender straight, curved, or bent rods occurring either singly or in groups, but characteristically in chains of several segmenting organisms, sometimes swollen at one or both ends and frequently beaded. Reproduction occurs by binary division. Endowed with independent motility, moving in the direction of the long diameter, living within the red blood corpuscles of man and producing a grave form of anemia known in Peru as oroya fever. Stained preparations suggest differentiation of cytoplasm and nuclear material.

As regards verruga, a disease characterized by an eruption of skin and occasionally of mucous membranes, particularly of mouth and throat, they note that the skin distribution resembles that of yaws, but that the two diseases are distinct. The virus of verruga produces a characteristic local lesion when injected into the testicles of rabbits. The dog and monkey can also be inoculated. In a human volunteer material from verruga lesions was vaccinated into abrasions made on his right shoulder. Sixteen days later small cherry red papules appeared. There was no fever or anemia in this case nor were the parasites of oroya fever observed in his blood.

Finally, the commission found that uta, a disease which has been considered as syphilitic, prehistoric leprosy, or lupus vulgaris, on account of the ulcerative lesions, was due to a species of Leishmania.—(E. R. S.)

Conran, P. C. **Ancylostomiasis in Nyasaland.** Jour. Lond. Sch. Trop. Med., Nov., 1913.

The author notes that the natives came for treatment chiefly by reason of pain in the epigastrium, "as if something were biting them," and on account of blood in the stools. The cases with melena were invariably associated with schistosomum infection, as blood was

never observed in the stools of those with hookworm disease alone. It is noted that schistosomiasis closely simulated dysentery, blood being passed at stool with marked griping and tenesmus.

As regards ancylostomiasis, it is stated that next in frequency to a history of epigastric pain came dyspnea, palpitation, and dizziness. Joint pains, simulating rheumatism, were common. Dirt eating, especially among the children, was apparently common. The expression of the patients was dull and listless, the pulse rapid and of low tension, and the muscles flabby. Dr. Conran was unable to obtain definite information as to previous attacks of ground-itch among the patients.—(E. R. S.)

WALKER, E. L., AND SELLARDS, A. W. **Experimental entamebic dysentery.** Philippine Jour. Sci., Aug., 1913.

In the opinion of the reviewer this is the most important paper on the subject of amebic dysentery that has appeared. It is scientific and at the same time practical.

The authors note the objections to experimental amebiasis in animals, in particular that the species of ameboid organisms fed to and recovered from the experimental animal have not been accurately determined. Very interesting, too, is the statement that they have not been able to parasitize animals with pathogenic entamebæ.

The experiments recorded in this article were made in men who had been under observation for years at Bilibid Prison, whose food was cooked and the water they drank distilled. Moreover, there were complete records of examination for intestinal parasites, including entamebæ. They were under complete control and the existence or possibility of natural infection with amebæ was reduced to a minimum. All the men fed pathogenic amebæ were volunteers and each signed, in his native dialect, an agreement to the conditions of the experiment.

The first series of experiments was with cultural amebæ, in order to refute statements that amebæ cultivated from water or other nonparasitic sources, as well as from dysenteric stools, are capable of living in man parasitically or of producing dysenteric symptoms. Twenty men were fed with cultures of amebæ without the development in a single instance of dysentery or the finding of such amebæ in the stools upon microscopical examination. In 13 cases they recovered the amebæ in cultures from the feces from the first to the sixth day, but never afterwards. They stated definitely that cultural amebæ are nonpathogenic.

The next experiments were with *Entameba coli.* The points that differentiate this ameba from *Entameba histolytica* are its porce-

laneous appearance; greater refractiveness, more sluggish motility, a distinctly visible nucleus, the larger size and more refractive appearance of its cysts, which contain 8 or more instead of 4 nuclei, and by the frequent finding of such entamebæ in the stools of healthy persons.

In the 20 cases fed with material containing *Entameba coli* there was a uniform failure to recover them culturally and in no instance was dysentery produced. Seventeen became parasitized as the result of a single feeding in from 1 to 11 days, the entamebæ being found in the stools and persisting in their appearance in the stools for extended periods. They conclude that *Entameba coli* is nonpathogenic, is an obligate parasite, and can not be cultured.

The third series of 20 feedings, carried on by Walker alone, was with *Entameba histolytica*. The material was mixed with powdered starch or magnesium oxide and given in gelatin capsules. In these experiments they obtained tetragena cysts in the stools of men fed only motile *Entameba histolytica*, and motile *Entameba histolytica* in the stools of men who were fed only tetragena cysts and finally an alternation of motile *Entameba histolytica* and tetragena cysts in the stools of a man having a recurrent attack of amebic dysentery.

Seventeen of the men became parasitized after the first feeding; 1 required three feedings, and 2, who did not become parasitized at the first feeding, were held as controls. Only 4 of the 18 parasitized men developed dysentery, which came on after 20, 57, 87, and 95 days, respectively, after the ingestion of the infecting material.

In 4 cases fed with material from acute dysenteric stools or from amebæ-containing pus from liver abscess there was no resulting dysentery, the 4 cases of experimental dysentery resulting from feeding of material from normal stools of carriers.

As regards the cases which became parasitized, but did not develop dysentery, it is suggested that the entamebæ live as commensals in the intestine of the host and only penetrate the intestinal mucosa and become tissue parasites when there occurs depression of the natural resistance of the host or as the result of some lesion of the intestine. That the pathogenic amebæ are more than harmless commensals, however, is shown by the fact that they alone, and not the nonpathogenic *Entameba coli*, are capable of penetrating a possibly damaged intestinal mucosa.

The following practical points are made in Part V of the article:

1. The material for the microscopic examination should be obtained without the previous administration of a purgative, because *Entameba histolytica* so obtained is in a preencysted stage, at which time it resembles *Entameba coli*. That there is little danger of overlooking *Entameba histolytica* in a stool naturally obtained is

shown by the statement that in 930 examinations of such stools, using only a single coverslip preparation, the entamebæ were found 664 times. It is also stated that *Entameba histolytica* is more constantly present and is to be more constantly found in the stools of persons parasitized with it than is *Entameba coli*. The objection that motile forms are not likely to be found in formed stools leads the author to state that the usual textbook opinion that only motile amebæ should be considered as such is erroneous and that the recognition of nonmotile or encysted amebæ can be certainly made by an experienced man.

Again, it is in the encysted stage that we are best able to differentiate the human intestinal amebæ.

Attention is called to the fact that amebæ do not usually appear in the pus draining from a liver abscess before several days subsequent to the operation.

It is advised that dysenteric or diarrheal stools be examined as soon as possible after passage, since motile entamebæ quickly die and disintegrate. On the other hand, encysted entamebæ in the formed stools of chronic and latent infections persist unchanged for days.

Attention is directed to the preliminary examination of the preparation with a low-power objective. Thus with a Leitz No. 3 objective the entamebæ appear as round, oval, or irregular refractive dots, which stand out distinctly in the background of the preparation. An experienced microscopist can even distinguish the encysted *Entameba coli* from *Entameba histolytica* with such a low power. The encysted entamebæ are more refractive than in the motile stage and are surrounded by a more or less distinct cyst wall.

The examination of fresh material is considered more satisfactory than of stained specimens. To prepare the latter, thin, moist smears are fixed in sublimate alcohol for 5 to 15 minutes, and then washed in water and stained with aqueous alum hematoxylin for 3 to 5 minutes. The sublimate alcohol fixative is 1 part of absolute alcohol and 2 parts of saturated aqueous solution of corrosive sublimate, the alcohol to be added to the bichloride just at the time of using. The formula for the hematoxylin stain is:

Hematoxylin crystals	1
Sat. aq. sol. ammonia alum	100
Distilled water	300
Thymol	A crystal

The stain should be ripened for about 10 days in a bottle with a loose cotton plug.

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As differentiating the two entamebæ, the following table is given:

MOTILE STAGE.

A. *Entameba histolytica.*	B. *Entameba coli.*
1. Appearance hyaline.	1. Appearance porcelaneous.
2. Refractiveness more feeble.	2. Refractiveness more pronounced.
3. Movements active in the fresh stool.	3. Movements sluggish.
4. Nucleus more or less indistinct.	4. Nucleus distinct.
5. Chromatin of nucleus scanty.	5. Chromatin of nucleus abundant.

ENCYSTED STAGE.

A. *Entameba histolytica.*	B. *Entameba coli.*
1. Cyst smaller.	1. Cyst larger.
2. Cyst less refractive.	2. Cyst more refractive.
3. Cyst usually contains elongated refractive bodies known as "chromidial bodies."	3. Cysts do not contain "chromidial bodies."
4. Nuclei never more than 4.	4. Nuclei 8, occasionally more.
5. Cyst wall thinner.	5. Cyst wall thicker.

A very valuable paragraph in Part VI of the conclusions is that "Since there is evidence that ipecac treatment, which is very efficient in relieving attacks of entamebic dysentery and causing the entamebæ to disappear temporarily from the stools, does not always kill all of the entamebæ in the intestine, treatment should always be controlled by stool examinations for *Entameba histolytica*. By this precaution relapses, so common in entamebic dysentery, can be forestalled." It is also noted that "in consequence of the relatively long incubation period of entamebic dysentery, the prevalence of chronic and latent infections, and the frequent failure of treatment to kill all of the entamebæ in the intestine, carriers of *Entameba histolytica* are common in endemic regions."

As prophylactic measures it is advised that the following be carried out:

(*a*) The identification of carriers of *Entameba histolytica* by the microscopic examination of the stools of convalescents, household servants, and other suspects or persons whose employment or associations make them particularly dangerous to the public health.

(*b*) The sanitary disposal of feces.

(*c*) The treatment, controlled by microscopic examination of their stools, of all carriers of *Entameba histolytica*.— (E. R. S.)

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

A. B. CLIFFORD, passed assistant surgeon, and G. F. CLARK, passed assistant surgeon, United States Navy.

MUSSER, J. H., JR., AND KRUMBHAAR, E. B. **The relation of the spleen to the blood destruction and regeneration and to hemolytic jaundice—6, the blood picture at various periods after splenectomy.** Jour. Exper. Med., Nov., 1913.

This is one of a series of articles on the spleen under the above main heading.

After splenectomy anemia usually develops quickly and reaches its height in from 3 to 6 weeks, then with gradual improvements the blood picture approaches the normal after about 3 to 4 months, with complete return to normal in 5 to 10 months. As a rule the decrease in hemoglobin content occurs a little sooner and is more marked than the fall in the red cell count; also as improvement begins, the increase in hemoglobin falls behind the increase in red cells. All the animals developed a marked leucocytosis of 26,000 to 38,000 per cubic millimeter of blood on the day after splenectomy, with a rapid fall in a few days to 20,000 and then a more gradual decrease to almost the normal level at the end of 4 months.

The initial leucocytosis was mainly due to an increase in polymorphonuclear leucocytes. There was also a transient eosinophilia.

Variations may occur in that the anemia may develop slowly and be of slight degree, or the reparative process may be delayed and up to 10 months may be incomplete. The anemia is, however, inevitable, as is also later, some degree of repair. The authors at present have no explanation to offer either of the anemia that follows splenetomy, or of the later blood regeneration.- (A. B. C.)

LAIRD, A. T., KITE, G. L., AND STEWART, D. A. **The presence of tubercle bacilli in the feces.** Journal Med. Research, Oct., 1913.

The authors review briefly the reports of various workers on the presence of acid-fast bacilli in the stools and summarize the work as follows: Acid-fast bacilli have not often been found in the feces of healthy persons. They have frequently been found in the stools of tuberculous patients, and when present they are usually to be considered tubercle bacilli. According to some writers they are found only in those cases where tubercle baccilli have been present in the sputum. Others report their presence in the feces, not only when they have not been found in the sputum, but even when there has been no sputum. According to Phillip and Porter the examination of the feces would be of more value in diagnosis than the examination of the sputum. Hoping to confirm these findings, the authors made numerous examinations of stools for acid-fast bacilli, tried to cultivate them from the stools, and made animal inocula-

tions. They found acid-fast bacilli in the stools of a large proportion of consumptive patients having tubercle bacilli in their sputum and only rarely in the stools of other persons. A large percentage of their guinea pigs inoculated with feces containing acid-fast bacilli developed tuberculosis. This supports the view that such bacilli are usually tubercle bacilli. Negative results of animal inoculation with feces not containing acid-fast bacilli also support this view. Unlike Phillip and Porter and Rosenberger, they were unable to find acid-fast bacilli in the feces of many persons who did not have tubercle bacilli in their sputum. They consider the swallowing of sputum as the chief source of tubercle bacilli in the stools, recognizing, also, as a possible source discharging ulcers in the bowel. Their work gives no support to the view that the bacilli may reach the intestine by way of the blood, and they consider that the frequent presence of tubercle bacilli in the blood of consumptives is far from a proved fact. Their results indicate that virulent tubercle bacilli are nearly always present in the feces of patients with open pulmonary lesions. Hence the stools should be disinfected as carefully as the sputum and disposed of in such a way that they can do no harm. Sewage contamination of the water supply offers an interesting field for study.—(A. B. C.)

CHEMISTRY AND PHARMACY.

E. W. BROWN, passed assistant surgeon, and O. G. RUGE, chief pharmacist, United States Navy.

REICHARDT, C. J. **Detection of bile pigments in urine.** Pharm. Zeit. 1913, 58, 591–592.

Attention is drawn to the fact that very dark colored urines fail to give a positive reaction with Gmelin's test. Only when the urine has been exposed to air and light, and probably to bacterial decomposition, the bilirubin oxidized to biliverdin, and the chromogens and indigo compounds reduced, is it possible to detect the presence of bile pigments.—(E. W. B.)

SHREWSBURY, H. S. **Value of the guaiacum test for blood stains.** Analyst, 1913, 36, 186–189.

When properly carried out, the guaiacum test is of value in detecting the presence of blood in stains on linen, etc., but must, however, be regarded as a sorting test and the indications it affords confirmed by supplementary tests. The guaiacum tincture employed must be prepared freshly, as when but 24 hours old it gives poor results. The fabric to be tested is moistened and a few drops of guaiacum tincture are added. If no coloration is produced within a few sec-

onds, a few drops of hydrogen peroxide solution (20 vols.) are added. When blood only is present, a blue coloration develops within 1 second after the addition of the peroxide. Blood never reacts with guaiacum alone, but certain substances, such as oxydases, oxidizing agents, etc., yield a coloration with the reagent before the peroxide is added. The presence of urine or sweat does not vitiate the test under the conditions given. The guaiacum test will readily reveal the presence of a blood stain that has been washed thoroughly.—(E. W. B.)

RUTTAN, R. F., AND HARDISTY, R. H. M. **New reagent for the detection of traces of blood.** Canadian Med. Assoc. Jour., Sept., 1912.

A 4 per cent solution of O-toluidine in acetic acid was found to be a very sensitive reagent for blood in the presence of hydrogen peroxide. One part of blood in 7,000,000 parts of solution can be detected by the aid of this reagent, whilst the guaiacum test will detect 1 part in 50,000, and the benzidine test 1 part in 700,000. The O-toluidine reagent is also the most sensitive test for the detection of blood in urine, stomach contents, etc., being capable of detecting 1 part in 24,000, whilst the other two reagents mentioned will not give a reaction with less than 1 part of blood in 6,000 parts of fluid.—(E. W. B.)

MILROY, JOHN ALEXANDER. **Estimation of urea.** Biochem. J., 1913, 7, 399–409.

The procedure is as follows: The phosphates present in the sample of urine are removed by precipitation with baryta mixture. Twenty-five cubic centimeters of the filtered urine are titrated with N/10 hydrochloric acid until neutral to methyl-red, 5 c. c. of neutral formaldehyde are added, and the titration with decinormal alkali is completed. This gives the approximate amount of nitrogen in the form of preformed ammonia and amino-acids.

Ten cubic centimeter portions of the filtrate are heated with 8 c. c. of N sulphuric acid at 155° for 1.5 hours in an autoclave. After filtering, the formaldehyde titration is effected in the usual manner; it gives the preformed ammonia and amino-acids above, for which deduction can be made, together with amino-acids set free by hydrolysis and the ammonia derived from the urea. The distillation methods give the preformed ammonia and that formed by hydrolysis of urea. Comparative experiments show the formaldehyde titration method to give a positive error of 1.7 per cent of urea, but it has the advantage of being quicker and giving at the same time an approximate estimate of the preformed ammonia and amino-acids.—(E. W. B.)

HERLES, F. **Estimation of uric acid in urine.** Eighth Inter. Cong. App. Chem. 1912, 19, 141–144.

The principle of this quick process consists in precipitating the urate by ammonium chloride as ammonium salt, according to the method of Hopkins and others, treating this precipitate with excess of N/10 sulphuric acid, and estimating the excess of acid added by titration with alkalis, using methyl-orange as an indicator, as this is not affected by the uric acid. One cubic centimeter of N/10 acid is equivalent to 0.01682 gram of uric acid. If the urine is not clear, the uric acid precipitate is dissolved in water with addition of alkali, sufficient of which must be added to produce a red color with phenolpthalein, the mixture is heated, made up to a definite bulk, and an aliquot part is filtered off from the phosphates precipitated. In this portion the uric acid is estimated by the method described above.—(E. W. B.)

EYE, EAR, NOSE, AND THROAT.

E. J. GROW, surgeon, and G. B. TRIBLE, passed assistant surgeon, United States Navy.

MAXEY, E. E. **Probable deleterious effect of salvarsan on the eye.** Ophthalmology, Oct., 1913.

Unable to find in literature an authentic case of injurious effect of salvarsan on nonsyphilitic eyes.

Relapses of syphilitic eye conditions, existing at the time of administering salvarsan, have been reported by numerous observers, and all seem agreed that they have there had to contend with reactions of syphilitic nervous tissue to the stronger antisyphilitic remedy. Such relapses, according to Ehrlich and others, never follow where large doses of salvarsan were used, and, he says further, if the relapses were directly caused by salvarsan, as assumed by some, the striking favorable effect of the second injection would be entirely inconceivable.

Literature seems to show fewer of these relapses since the profession has learned the benefits of larger dosage. Many observers report no relapses after the use of salvarsan.

In the earlier reports many were united in advising that salvarsan be withheld in all cases showing an abnormal condition of the optic nerve. Later on somewhat doubtful cases were treated with the remedy, not only without injury, but in some cases the treatment was of marked benefit to the diseased eye.

Probably the best review of the present opinion in regard to the use of salvarsan in diseases of the eye is that presented by Dr. Stephenson at the meeting of the British Medical Association, in brief, as follows:

Salvarsan should be given by intravenous injection, administering at least two or three maximum doses at intervals of a few days. Tertiary symptoms appear earlier after the use of salvarsan, thus changing the type of syphilis, these changes being more frequent after the use of small doses. The general symptoms following salvarsan are due to faulty technique. Recently it has been shown that salvarsan is contraindicated in severe vascular lesions of the eye with a tendency to hemorrhage. Salvarsan is innocuous to the healthy optic nerve and can be administered safely and with great advantage in syphilitic affections of the nerve. It appears that when properly given salvarsan presents no particular danger to the body or to the eye. It is most likely to be useful in primary and secondary manifestations, particularly of affections of the uveal tract, and it is well to combine it with mercury.—(E. J. G.)

DAVIS, A. E., PROF. OPHTHALMOLOGY, NEW YORK POSTGRADUATE SCHOOL. **Effect of salvarsan on the eye.**

It is now almost universally considered that salvarsan should be given intravenously and should be freshly prepared with freshly distilled water; otherwise many complications of a deleterious nature may take place. Furthermore, it is my personal experience that salvarsan does not injure the eye in any way even in acute inflammations of the retina and the optic nerve; and I may say that John A. Fordyce, of New York, has come to the same conclusion—that salvarsan has no injurious effect on the eyes whatsoever. It was his practice when he first began to give salvarsan to have the eyes examined in every case and if the optic nerve was affected not to give the remedy. Now he does not take the trouble to have the eyes examined, as the only effect on them, in his opinion, is a beneficial one.—(E. J. G.)

IGERSHEIMER, DR. (HALLE). **Fate of patients with parenchymatous keratitis due to hereditary lues.**

From practical experience and theoretical consideration, he concludes that parenchymatous keratitis occurs only in florid lues, and this ought to be fought against before the corneal affection sets in. If keratitis has once developed, specific and other remedies are of little avail; but the antiluetic treatment must be very energetic for preventing relapses, affections of the body, especially of the nervous system, which are often ascertained after the elapse of the corneal affection and the rare propagation of syphilis to the third generation. Even after the ocular affection is cured the treatment must be continued in intermissions until the symptoms of lues, especially the

positive Wassermann reaction, have permanently subsided. The disease of the second eye may very often reach the same degree as the first, but generally the inflammation lasts a shorter time.—(E. J. G.)

GREEN, DR. **Trachoma, prevalence of, in the United States.** Interstate Med. Jour., June, 1913.

It is impossible at the present time to arrive at a complete knowledge of the prevalence of trachoma in the United States, for the reason that as yet no general survey of the disease has been taken. The prime obstacle on the part of the investigator would be that with rare exceptions boards of health have failed to realize that trachoma is a dangerous contagious disease, and hence have not included it in the list of reportable diseases.

Schereschewsky considers that the disease has not yet become general, though it is frequent along the Atlantic seaboard, owing to immigration; it is found in the West, owing to migratory movements. In certain areas of southern Illinois and in the mountains of Kentucky and West Virginia it has been endemic for many years.

Although New York City has the greatest number of cases in any one focus, yet here the disease is declining, when the increasing population is considered. This decline is noticed in Baltimore, Cleveland, and Philadelphia. In Toledo and Akron, Ohio, it is on the increase, while in Dayton, Ohio, it is assuming alarming proportions.

The United States health authorities find that about 12 per cent of 4,000 persons taken at random have the disease.

In Oklahoma, White and Treibley found 65 per cent of the 100,000 Indian population to be sufferers from trachoma. From 20 to 40 per cent of all the white children of Oklahoma were trachomatous.—(E. J. G.)

SKILLERN, R. H. **The exploratory needle puncture of the maxillary antrum in 100 tuberculous individuals.** Jour. Amer. Med. Assoc., Vol. LIX, No. 12.

Reviewing the post-mortem findings of Harke, E. Frankel, Wertheim, and Minder, who have reported the presence of sinus disease in from 33 to 60 per cent of cases dying from pulmonary tuberculosis, the author is of the opinion that these results are not in keeping with the clinical findings.

In only 11 per cent was he able to demonstrate disease, and in only 3.5 per cent was purulent secretion present.

In part he accounts for the dissimilarity of the findings by the movement of the cilia, which normally tend to extrude infectious agents; but shortly after death, the action of the cilia ceasing, secretion from the mucous membrane and infectious agents would tend to accumulate.

In conclusion he states:

1. The sinuses in health are free from bacteria.

2. Tuberculous individuals are not more prone to sinus inflammation than are other individuals.

3. Tuberculosis of the lungs does not predispose to sinus inflammation.

4. Genuine tuberculous processes are rarely, if ever, found isolated within a sinus.—(G. B. T.)

TUNNICLIFF, R. **Anerobic organism associated with acute rhinitis.** Jour. Infectious Diseases, Vol. XIII, No. 2.

In a series of 25 different patients examined during attacks of acute rhinitis, 1 case during each of 4 and another during each of 5 attacks, Tunnicliff found an anerobic organism varying from 5 to 8 microns in length and ⅓ to ½ micron in width. The ends are round or slightly pointed, bodies usually slightly curved and presenting occasionally a ball-like enlargement at one end. Sometimes bunches and rosettelike arrangements occur. This organism is described as strictly anerobic, growing at 37° C. In cases with accompanying pharyngitis or bronchitis this organism is also present in the sputum. By swabbing the mucous membrane of the nose in individuals not showing this organism Tunnicliff was able in some cases to produce a slight rhinitis, the secretion showing this organism in pure culture.—(G. B. T.)

DICK, G. F., AND BURMEISTER, W. H. **Toxicity of human tonsils.** Jour. Infectious Diseases, Vol. XII, No. 2.

The authors, after a careful study, found that the toxicity was in proportion to the bacterial flora contained, particularly the hemolytic streptococci. In 10 of the 33 cases in which comparatively no toxic extracts were obtained only 1 showed hemolytic streptococci in culture.—(G. B. T.)

MISCELLANEOUS.

Jahresbericht des Aerztlichen Vereins (year book of the medical association) zu. Frankfurt a. M. 1912. Munchen, 1913.

The Bulletin is in receipt of the above publication of 255 pages and an appendix of 74 pages, containing the proceedings of the above society for internal medicine during the year 1912.

From, E., favors a civic control of disinfection during entire course of all contagious diseases by a specially trained corps of nurses, materials for same to come from municipal appropriation or public charity. Their sole duty should be that of the sanitarian, and tact would be

required to avoid misunderstandings. The discussions that followed the above paper expressed doubt of the practicability of the plan owing to the probable lack of coordination between physician and nurse in many cases and the coolness which would frequently greet the nurse's efforts, particularly amongst the wealthier classes.

Dreyfus, Georges S., the dosage of salvarsan: The use of absolutely freshly-distilled water is the best preventative of untoward reactions. We have gradually learned the lack of poisonous qualities in much larger aggregate dosage than were at first used, without yet learning the maximum; but a preparation containing about 33 per cent of arsenic must not be used unguardedly. The author gives 8–9 grains in divided doses over a period of 6–8 weeks, the individual dose not exceeding 0.75–0.9 grain.

He emphasizes repeatedly the worse than uselessness of small dosage. Neural sequelæ are seen much less frequently since the dosage has been increased, and particularly when combined with mercury. He claims that latent disease of the central nervous system is stimulated into activity by a small injection, without sufficient salvarsan being there to effect a curative action. He bases his observations on frequent examination of the cerebrospinal fluid (pressure, albumin, cells, and Wassermann) and blood (Wassermann). In no cases in which no abnormality of the cerebrospinal fluid was found before injection did any such appear after salvarsan was administered. He has found the fluid a very true barometer, checking up always with improvement or retrogression in the clinical symptoms. Whether in primaries or secondaries, whether in untoward nervous sequelæ of salvarsan administration, in cerebrospinal syphilis, in tabes, or in paresis, large and persistent dosage is indicated. Those cases of tabes which have done badly under salvarsan-mercury treatment do better if the salvarsan is continued alone.

The following is the author's scheme, modified somewhat to individual cases:

1 day after lumbar puncture, 0.03 grain calomel intramuscularly.
3 days after lumbar puncture, 0.05 grain calomel intramuscularly.
5 days after lumbar puncture, 0.4 salvarsan.
7 days after lumbar puncture, 0.5 salvarsan.
9 days after lumbar puncture, 0.05 calomel.
11 days after lumbar puncture, 0.05 calomel.
13 days after lumbar puncture, 0.04 salvarsan.
15 days after lumbar puncture, 0.05 salvarsan.
17 days after lumbar puncture, 0.05 calomel.
With occasional lumbar puncture.

In the 6 weeks' (minimum) course about 12 calomel injections and about 5.4 grains salvarsan are given. It is best, both for observation and for best results, not to treat the cases as ambulatory ones.

Never give an injection unless the patient feels absolutely well and is without fever. It is best to repeat the whole course 2 or 3 months later, even if cure seems established.

In all stages of syphilis and metasyphilis under unfavorable circumstances an insufficient treatment with salvarsan can produce harm. It is therefore advisable rather than administer too small doses not to give at all. The result of massive dosage with salvarsan (5–6 gr.), best in combination with mercury, during 6–8 weeks, gave very much the best results.

Dreyfus, Georges S., Origin, Prevention, and Treatment of Nervous Sequelæ after Salvarsan: A comprehensive elaboration and reiteration of one phase of the above.

Rosenmeyer (p. 140) demonstrated a case of parenchymatous keratitis in congenital syphilis treated by neosalvarsan locally, using it in the form of granules in one eye, in the other a freshly prepared 2 per cent solution. Funk-Radebeul has been using a sterile oily atropine solution as vehicle, one drop twice daily.—(R. C. RANSDELL, PASSED ASSISTANT SURGEON, S. S. NAVY.)

REPORTS AND LETTERS.

NOTES ON THE CLINICAL CONGRESS OF SURGEONS.[1]

By G. F. Cottle, passed assistant surgeon, United States Navy.

In obedience to orders, I attended the fourth meeting of the Clinical Congress of Surgeons of North America, which met at Chicago, Ill., November 10 to 15 of this year. The history and aims of this congress have been fully set forth in the Journal of Surgery, Gynecology, and Obstetrics.

A college of surgeons was established by the directors of this congress, with the power to examine candidates and to confer a degree indicative of surgical training and ability sufficient to entitle one to be considered a surgeon. The establishment of this college constitutes a long step toward the day when surgery shall be regarded as an established craft. It heralds the day when a surgeon will be an artisan of known training and technical ability, whose manual dexterity is a therapeutic weapon at the command of the medical profession. A logical success for the college should remove the average surgeon from the field of exploration and make him a follower of proven and known methods. It should limit the opportunity now allowed to untried men to follow untried methods and give greater scope and greater liberty to men of unusual ability to advance the practice and theory of surgery in new fields. The college should eventually cause the internist to take his proper place at the head of the profession and put the surgeon second to him. The college should bring better care of patients and opportunity for sound and real leadership. The aims of the college are high. Its future depends upon the honesty of purpose and plan present in its membership after the enthusiasm of its founders dies away.

The 3,000 or 4,000 doctors who attended the congress were given an opportunity to see what good surgical work is being done every day in Chicago, and to hear at the same time speakers from other sections of the country and from Europe whose names and work are widely known. To see and hear such men as Murphy, the Mayos, Sir Arbuthnot Lane, Crile, Harvy Cushing, Deaver, Bloodgood, Finney, Cullen, Howard Kelly, and Roswell Park, all in the space of five days, is an opportunity well worth an effort. Those who attended felt the meeting was worth their time. Each day the clinics of the city were open to the visiting doctors. Each evening papers on surgical themes were read by distinguished visitors. It was, of course, impossible for any one visitor to see and hear all that was offered, and difficult to report so large and complex a congress. The

[1] Abstracted from an official report to the Bureau of Medicine and Surgery.

papers read will be published in current medical and surgical magazines. The subjects of major interest were: Operative procedure in the presence of symptoms indicative of gastric and duodenal ulcer; present day efforts directed toward investigation of and attempted control of cancer; therapeutic uses of X ray and radium in the treatment of tumors benign and malignant; surgery of the bones and joints.

Mr. Herbert Patterson, of London, delivered a telling blow at the mechanical explanation of the benefits derived and to be expected from gastroenterostomy. He gave a series of gastric analyses made before and after gastroenterostomy which explained the benefits of the operation on a chemical ground. His analyses showed an increase in mineral salts in the gastric contents after operation which he interpreted as a direct consequence of the entrance of duodenal contents to the gastric mucosa by the way of the new opening. He thought the leakage of alkaline duodenal contents into the acid stomach contents was the immediate cause of improvement after the operation. He advocated the anterior rather that the posterior gastroenterostomy. He stated that the advocates of the posterior opening forget that greatly improved technic of anastamosis was introduced at the same time the posterior opening came into vogue, and that the better results attributed to posterior gastroenterostomy are really due to improved details of suture and handling. In control of cancer the greatest dependence seems still to be upon early diagnosis and radical removal. Publicity of the effects of cancer, its frequent occurrence, and the importance of the earliest radical removal was strongly advocated.

Howard Kelly read a remarkable paper, in which his ability as a speaker led the audience to feel that in radium we have a valuable means of treatment for cancer. His enthusiasm for this remedy was justified by remarkable improvement shown in his series of cases, but he failed to convince his audience that in radium we have a cure.

Prof. Dr. Kronig, of Freiburg, Germany, showed what remarkable reduction in size would occur in malignant neoplasms treated by X-ray. He showed by tissue microscopy that X-ray causes thickening of arterial walls, then occlusion, and finally the conversion of neoplastic tissue into scar tissue with disappearance of evidence of malignancy as shown by the microscope. He was, however, very guarded in his conclusions as to whether in X-ray we have a cure for cancer. More definite was his claim that X-ray properly applied will cure uterine myomata. If this claim be ultimately substantiated we will have in this remedy a substitute for the scalpel in uterine myomata and the operation of hysterectomy for this condition, with its attendant mortality will be placed in the scrap heap of surgery.

Hugh Cabot read a paper on the surgery of the upper urinary tract, which clearly demonstrated the wonderful accuracy which radiography and pyleography have brought to the diagnosis of diseases of this portion of the body. The ability to give the exact position of a kidney stone and its relation to the pelvis of the kidney or to different parts of the ureter, and to show the exact condition of the kidney pelvis and of the ureters, are aids which make it possible for the surgeon to attack this apparatus, which is deeply placed and hard to approach, with far greater success and better ultimate benefits to the patient than used to follow his efforts when urethral catheterization was the main diagnostic weapon.

A paper by Harvy Cushing, in which he modestly reported a series of 150 operations for removal of the gasserian ganglion without a death in the last 110 cases, showed what wonderful results can be obtained by hard work and infinite pains in a field so difficult as this. He advocates avulsion of the proximal portion of the fifth nerve in addition to the removal of the ganglion itself.

A paper by C. H. Mayo, summing up the goitre question, showed the tremendous experience he has had in this particular field of surgery. Judd, of the Mayo clinic, stated that ligation of the thyroid vessels, advocated and practiced at that clinic, is not considered a curative measure in exophthalmic goiter. It is used merely to lessen the thyroid secretion so as to allow the patient to improve sufficiently to get in proper condition for the operation of partial thyroidectomy.

The most difficult to report, and yet the most valuable to those who attended the congress, was the opportunity afforded by the surgeons of Chicago to see them work in their clinics and operating theaters. During the 5 days of the meeting Murphy talked and demonstrated cases and operations to a packed amphitheater 4 out of the 5 days. He spoke of and demonstrated surgical topics where he has long been a leader; but he devoted most of his time to operations and demonstrations of results in the field of the bone and joint surgery, where to-day he is in the vanguard of those who are developing this field which so long has baffled the profession. At Murphy's invitation Sir Arbuthnot Lane, with his inimitable technique, approximated a fractured tibia and used his metal plate to secure the fragments in apposition. During the greater part of the week Murphy repeatedly operated upon ununited fractures without the Lane plate, but with the autobone transplant. He insisted on the fact that in his cases of autobone transplant he had the transplant eventually replaced by living bone in 100 per cent of the cases. The principles he has evolved as underlying success in osteoplasty and arthroplasty have been published by him and need not be dwelt upon.

As a demonstrator of surgical operative technique, a clear reasoner and incisive talker in the operating room, Arthur Dean Bevan takes a very high place. His clinics were crowded and of great value to the visitor. He strongly believes in teamwork for surgery; that is, the close association of the internist and the surgeon in the operating room. Ochsner, Carl Beck, Dean Lewis, E. Wyllys Andrews, Eisendrath, and a score of other able surgeons demonstrated a large series of operations and surgical cases to audiences as large as the seating capacity of their several operating rooms would allow.

In Chicago one is struck by the emphasis the surgeons lay upon cooperation between surgeons and internists, radiologists, and pathologists. The object lesson of the Mayos' clinic at Rochester, Minn., where such cooperation has been brought to a high degree of perfection, has been learned in Chicago, as it should be everywhere. The demonstration of the so-called borderland cases of surgery in the operating room, with a discussion of the case history and probable diagnosis immediately before operation, followed by the surgeon's demonstration of the living pathology, was of great interest to the onlooker, and it implied good results to the patient. Such internists as Frank Billings, Sippy, Herrick, and Mix demonstrated cases whose symptoms were such as did not frankly place them in the hands of the surgeon. Prominent in this class of cases were affections of the upper half of the abdomen, duodenal and gastric ulcer, biliary and pancreatic diseases, certain forms of chronic appendicitis, and surgical complications of typhoid.

After attendance at the surgical clinics of Chicago during a two years' tour of duty at the naval training station, Great Lakes, Ill.; after attendance at the congress held in Chicago, and after a week spent at the Mayos' clinic in Rochester, Minn., it seems fair for me to state that Chicago is a center of surgical activities which it would be well worth while for a naval surgeon en route through Chicago to visit. The Mayos in Rochester excel in the demonstration of the living pathology of the upper abdomen and of the thyroid gland: Murphy in Chicago excels as a teacher of surgery and especially as a leader in bone and joint work. These two clinics are easily accessible and ready to receive the interested visitor and will return him full value for time or effort spent in attending them.

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TRUMAN H. NEWBERRY,
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PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service not only will they be employed to some purpose as merited but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the Bureau extends an invitation to medical officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the Bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

W. C. Braisted,
Surgeon General, U. S. N.

U. S. NAVAL MEDICAL BULLETIN.

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SPECIAL ARTICLES.

REPORT OF THE FOURTEENTH ANNUAL MEETING OF THE AMERICAN ROENTGEN RAY SOCIETY,

Held at Boston, Mass., October 1 to 4, 1913.[1]

By J. R. PHELPS, passed assistant surgeon, United States Navy.

The convention was held in the Copley Plaza Hotel, where adequate space was found, not only in a room equipped as a lecture hall, for transaction of the scientific program and business, but also in the basement grillroom, where space was allotted to numerous manufacturers for their exhibits. Here, also, there was set up a large plate exhibit, contributed to by numerous members of the society.

Prominent roentgenologists from all parts of the United States and Canada were present, and they participated so numerously in discussion of the scientific papers, below mentioned and epitomized, that four full and busy days scarcely sufficed to complete the program. The convention was a remarkable illustration of the rapidity of growth, and a demonstration of the importance to which this specialty in medicine has attained. No region of the human body was neglected in the discussion of differential diagnosis and practical application of roentgen methods, whether the lesion be in bone or soft tissues, the thorax or abdomen, the skull or the extremities. Members of the society impress one as being a prosperous and well-educated set of men. Many of them possess decisive and altogether attractive personalities, and it is a real pleasure to listen to men like Pfahler, of Philadelphia; Baetjer, of Baltimore; Dodd, of Boston; and others of their stamp; earnest and experienced in their work, sincere in speech, but, withal, conservative. On the other hand, quite a few who took large parts in the proceedings seem to take themselves altogether too seriously. To one possessing some intimate knowledge of practical roentgen methods, but, on the whole, governed by general medical and surgical experience, neither the

[1] Abstracted from an official report to the Bureau of Medicine and Surgery.

assumptions nor the methods of the radical men appeal. Roentgen methods are truly sometimes positive and exact, but in the general field of medicine and surgery examination by means of X-rays is one diagnostic method only, and as such must always remain subordinate to the medical and surgical sciences collectively. Already certain roentgenologists are assuming responsibility for the whole diagnosis in obscure internal conditions, and they are even insisting that surgeons must be made to operate at their say. This is wrong. Enthusiasm is running ahead of progress, for other equally qualified and experienced workers can not agree as to the value of the methods and signs upon which the enthusiasts commit themselves. The surgeon or internist who allows the roentgenologist to decide when a patient shall be operated upon for renal calculus or duodenal ulcer is making a mistake. There is nothing mysterious or occult about a roentgenogram, and physicians should train themselves to interpret their own plates. Shadows so obscure that they can not be pointed out plainly and symptom complexes or signs upon which there is no general agreement form insufficient evidence upon which to permit the roentgenologist to base radical decisions.

The scientific program dealt almost wholly with problems of medicine and surgery; little was said of apparatus, and practically nothing of photographic technique. Present-day practice indicates that fluoroscopic methods are coming into use again, more and more. It was the consensus of opinion that diagnosis of many thoracic conditions, including many mediastinal lesions such as tumors, enlarged glands, and thoracic aneurism, require fluoroscopy in addition to plates for fine differentiation. Differential diagnosis of lesions within the abdomen, ulcers, carcinoma, adhesions, malpositions, spasms, stasis, obstructions, kinks, etc., whether of the stomach or intestines, is much facilitated by study of appearances on the fluoroscopic screen; diagnosis of such conditions depending much upon observation of departure from the normal variations of peristaltic waves, filling defects, and the time consumed in the passage of a bismuth meal through the different portions of the gastro-intestinal tract. Serial roentgenography alone seems to compensate the lack of screen examination. This method involves the making of a large number of plates in rapid succession, a true series, at different stages during the passage of a bismuth meal. Thirty or forty plates are thus required for the examination of a single stomach case. Such an examination is time consuming, expensive, and hardly applicable to hospital patients, where, as in many hospitals, it is now the custom to have all abdominal cases, except emergencies, examined roentgenologically as a routine, such evidence as may be afforded being considered entirely necessary and supplemental to the usual laboratory methods of investigation. The same considerations

apply to thoracic cases. The disadvantage of fluoroscopic examination is that it is difficult to secure adequate protection for the observer, with apparatus that will permit of palpation for adhesions, or pain points, during visualization of the affected parts on the screen. However, many members of the society consider themselves safe when protected by lead diaphragms which confine the X-light to areas under observation, the fluoroscopic screen at the same time being backed with lead glass. Others, preferring to sacrifice the advantage of palpating, remain in a cabinet or in another room, lead protected, and view the screen through a large mirror placed at an angle of 45°, in such position that they are not in the path of X-rays at all.

After a short business meeting, the scientific program began with a symposium on bone diseases.

Dr. R. Hammond, of Providence, R. I., presented a paper entitled, "The value of the roentgen ray in the prognosis of tuberculous bone lesions."

He brought out the point that improvement in the general condition of a patient precedes improvement in the bone lesions. and, of course, occurs long before favorable evidence can appear on an X-ray plate, but that occasionally a plate may give valuable indications to continue fixation treatment. In favorable cases, dense, healing osteitis is the first thing to appear; in unfavorable cases, softening. He mentioned a case that was apparently progressing favorably, and fixation was about to be discontinued. Roentgenograms showed atrophy of bone and softening. Treatment was continued, but the case pursued an unfavorable course and terminated with the death of the patient. If treatment had been discontinued without the plates, the surgeon might easily have felt responsibility for the later untoward result.

Dr. Robert B. Osgood, of Boston, Mass., an orthopedic surgeon, by invitation discussed the roentgen ray diagnosis of lesions of the lumbar spine and sacrum.

Attention was called to the great difficulty in getting the patient perfectly straight on the plate, with the spine perfectly central. The bones entering into the formation of certain joints have peculiarities which cause considerable variation in different persons. In general, disease of the bones leads to temporary or permanent atrophy, which is registered on the X-ray plate by decreased density. There are frequent anatomical differences in the fourth and fifth lumbar vertebræ. The fourth is a transitional ring. The fifth has the strongest arch, and its height is usually greater in front than in back. The transverse processes of the fifth lumbar vertebra show

infinite variety, and they are a subject of considerable importance in the causation of symptoms, as Goldthwaite and Osgood have pointed out. Bony fusion between the transverse processes and the ilium occurs. Large transverse processes on one or both sides, without or with fusion, are frequent. Lateral curvature of the lower portion of the spine causes numerous variations, but we are not yet in a position to decide anything definite about the cause. In regard to fracture of the fifth lumbar vertebra, there is reason to think that it is more common than was formerly thought. Some think that with a definite history of traumatism, when the arch is indistinct, the diagnosis can be made. Osgood does not think so. Dislocation is difficult of diagnosis also. His advice is to be circumspect in the diagnosis of both fracture, and dislocation and fracture. Infectious arthritis of the spine has no definite characteristics and the interpretation is often difficult. As for arthritis deformans, in the hypertrophic type, spiculated bone shadows are seen; and in the atrophic type, the spine is just a rod of bone. The typhoid spine is definite with the history. Tumors of the spine occur. Giant-cell sarcoma is the important one. It has the characteristics shown in other bones. Tuberculosis, on account of its frequency, and because it constitutes a subject in itself, was merely mentioned in passing. Tuberculosis of the sacroiliac joints may occur. Slight slipping will give asymmetry, but there is about an inch of range in motion in variations. Most cases can not lie down straight. However, it is a clinical and not an X-ray diagnosis. One can not be sure from the plate. More pathological evidence is necessary, but that is difficult to furnish. His conclusions were that it could not yet be said that such and such X-ray pictures are associated with such and such clinical pictures. This field is still indefinite, but radiograms are demanded in all cases where this region is affected for the light they may throw on variations or deformities of the fourth and fifth lumbar vertebræ, or tumors, as causative factors in the occurrence of pain or other symptoms.

Discussion.—Dr. R. O. Meisenbach believes that by putting the plate interpretations together with the clinical signs, appearance of subluxation of the sacro-iliac joints can be shown. He keeps the patient in one position, without flexing the legs. He called attention to the fact that many lumbo-sacral or sacro-iliac relaxations are purely secondary. In regard to variations of the fifth lumbar vertebra, intermittent pain in the back is sometimes caused by impingement of a large transverse process upon the crest of the ilium. Motion causes leverage by which the process is lifted up and snapped out. Frequent repetition of this difficulty probably leads to pachymeningitis with more constant backache.

Dr. P. M. Hickey thinks the stereoscopic method is of the utmost value in the discovery of bone or joint lesions in this field. He uses a special small converging cone to sharpen the focus and add detail to the bone shadows. When the results are negative, in cases referred to him for kidney examination, it is his plan to examine the lower spine and sacro-iliac region. He spoke of the frequency of carcinoma along the lower spine. Diagnosis usually rests on the indistinctness and erosion of the edges of the vertebræ on each side. He thinks fracture or sprain fracture causes an abnormal and noticeable opening between the articular surfaces, or the articular facets, of the articular processes between the fourth and fifth lumbar vertebræ.

Dr. George C. Johnston said that when an orthopedic man makes a clinical diagnosis he is duly grateful if the X-ray man backs him up; and if he doesn't, why, the diagnosis is so anyway. He called attention to the fact that since information about sacro-iliac disease has become so general among the laity, particularly since the osteopaths have fastened upon it, we are seeing it alleged with increased frequency where a certain kind of lawyer and a certain kind of doctor with ambulance chasers are concerned; and if a patient exhibits the symptoms and claims to have sacro-iliac trouble, no reputable physician can swear that he has not.

Dr. Stover thinks low-grade inflammatory processes are frequent in the lower spinal and sacro-iliac joints.

Dr. Syland takes plates with his patients standing, bending first to one side and then to the other. He thinks this method will show subluxations and variations.

Dr. Hunter has seen one typical plate only of luxation of the sacro-iliac joint on one side with one-half inch of separation. The deformity followed definite traumatism, a severe crushing injury.

Dr. George E. Pfahler, of Philadelphia, thinks we should be very conservative in making diagnoses on indistinct bone shadows.

Dr. George E. Pfahler, of Philadelphia, Pa., offered a scheme and a sketch for a water-cooled tube with continuous flow of water, as used in his office for prolonged-treatment work, where it is essential that the vacuum of the tube should not fall.

He uses a double water-flow tube. One tube, connected with the anode, directs the flow of water directly against the back of the target. The other water-tube leaves the X-ray tube near the end of the glass supporting the anode. He has arranged two glass jars of 2-gallon capacity each, supported by cord and counterweights hung from pulleys attached to the ceiling in such a manner that by pulling a cord one jar is raised to near the ceiling and the other is lowered below the level of the X-ray tube in operation. With this there is an X-shaped arrangement of short metal tubes, with four valves to

permit the water to enter the anode of the X-ray tube through the tube directing the incoming cooled water directly against the back of the target. The water leaving the X-ray tube flows into the jar which is, for the time being, low in position. He uses flexible metal tubing between the jars, reversing valves, and X-ray tube, as it was found that rubber deteriorates quickly. When the upper jar is nearly empty, the position of the jars is changed by pulling the cord, and the valves are reversed. In this way the water is made to flow through the X-ray tube in the same directions over and over, and the tube can be used for therapeutic work for hours at a time without heating or falling in vacuum.

Dr. James T. Case, of Battle Creek, Mich., on the subject, "Technique in examinations of the gastrointestinal tract," spoke of his methods in fluoroscopy.

He emphasized the importance of having dark walls, not necessarily black, and double doors or double curtains to the room, so that persons entering or leaving would not lighten the room. For an overhead working light he does not like red or green. Red irritates him, and green is too much like the fluorescent screen illumination. He prefers a low-power blue lamp in a yellow globe. A foot switch is very convenient for operating the X-ray tube, combined with the overhead light in such a way that a little pressure puts out the overhead light and more pressure lights up the X-ray tube. The amount of current used through the tube is 1 or 2 milliamperes. A transformer can not be used successfully. He prefers a coil with a mercury interrupter. He has no fear of causing dermatitis or reaction in ordinary cases where aluminum screens are used 2 or 3 mm. in thickness, and he has never seen a reaction even after a long examination. At least 20 minutes should be spent in the dark room to prepare the observer's eyes before attempting to examine a patient with the fluoroscopic screen. He showed the usual wooden palpating instruments, armed with metal disks for markers by means of which a patient can be palpated while being examined without exposing the operator's hands to the influence of the rays.

SYMPOSIUM ON GASTRIC AND DUODENAL DIAGNOSIS.

Dr. Lewis Gregory Cole, of New York, N. Y., presented a paper entitled "Diagnosis and differential diagnosis of gastro-duodenal lesions."

His first point was that a series of roentgenograms, 24 or more plates, assembled and studied singly and collectively, offered evidence equal to and even better than fluoroscopy. By serial radiography he means a true series, made at sufficiently short intervals to

give definitely accurate information about the bismuth picture of the stomach, during and between different peristaltic waves. That does not mean a number of plates made at haphazard intervals. Relating to carcinoma at the pylorus, he said the absence of rugae and the presence of indentations at the pylorus are characteristic of carcinoma. The cap is separated. Indentations high up in the stomach, even if persistent, may be due to spasm. He stated that he has made a positive or negative diagnosis of carcinoma in 528 cases, and not a case has been disproved by operation or autopsy. He feels positive that he is justified in urging surgical intervention when serial plates show persistent indentation and absence of rugae, with separation of the cap. He mentioned one case, examined for trivial gastric disorder, where appearances indicated beginning carcinoma. There was no clinical evidence whatever and the surgeons did not consider operation to be indicated, but they did operate after some delay. A small carcinomatous growth was found and removed, but the patient died later with general metastases throughout the abdomen. He feels that the roentgenographic evidence is definite in most cases, and when found, surgeons can not be urged too strongly to operate without delay. " You have got to make them operate!". He feels that this same attitude is justified in many cases of pyloric and post-pyloric (duodenal) ulcer. In regard to the cap, formed by bismuth in the first part of the duodenum, a good test for a normal cap is to cover up the pyloric constriction with the finger or a ruler, and then the normal cap looks to be the continuation of the stomach shadow. The effect of congenital folds, such as the gastrohepatic ligament, must be considered. Infolding is caused during development. During the later stages of the digestion of a bismuth meal, the cap is frequently more distended than earlier. In diagnosis, it should be borne in mind that the cap or first part of the duodenum, as the Mayos have well shown, has all the characteristics of the stomach, functionally, embryologically, and anatomically. If in a large series of plates, 24 to 40, according to the case, one fails to get a single normal cap shadow, the diagnosis of organic lesion is justified. If one plate in the series is found to show a normal cap, then one can make a negative diagnosis just as positively.

Dr. Arial W. George, of Boston, Mass., read his paper, entitled "The positive value of the Roentgen method in the diagnosis of gastric and duodenal lesions."

He said the literature shows a lack of positiveness as to conclusions, probably due to the lack of exactness in methods. He does not consider it necessary to make a mystery of the intestinal tract, even if most observers seem to be in accord that the diagnosis can only be

suggestive, and not conclusive. The exact method consists, first, in showing the first part of the duodenum. Ninety-five per cent of all ulcers occur here. The first part of the duodenum, or cap, is an entity, anatomically, and if normal, the cap can always be shown. A defect in the cap always means a disease or lesion. Any duodenal ulcer that is more than an erosion of the mucous membrane will always show some distortion of the shadow of the cap. He uses the serial plate method. It is thorough, and it will adequately show the cap. He said failure to demonstrate a normal, well-filled cap, with the patient prone, standing, or lateral, with serial plates, is due to faulty technique. With correct technique, the normal cap can be shown, with the patient in one or more of the three positions. The question is whether all duodenal ulcers can be shown on the plate. The extensive callus is what we try to demonstrate; not the pin-point ulcer. At any rate, more can be demonstrated on the plate than by the operating surgeon. In some exceptional cases, differentiation between duodenal ulcer and gall-bladder adhesions may be difficult. In these cases, fluoroscopy with palpation does help. As for the negative value of serial plates, he thinks it can at least be said definitely where a normal cap is found, that surgical interference is not necessary, even if we can not go so far as to say there is no ulcer. He is inclined to the opinion that it can be said definitely that there is no ulcer.

Dr. Edward H. Skinner, of Kansas City, Mo., read the paper prepared by Dr. Paul Eissen, of Milwaukee, Wis., entitled, "The action of the pyloric apparatus and the stomach as such, and the factors controlling both, with review of the literature."

This paper discussed the physiology of the stomach, with special reference to motility, and its action in delivering gastric contents into the duodenum, as observed by the fluoroscope, after ingestion of food to which bismuth had been added. Experimental work and citations from the literature covered much of the knowledge of gastric function. From a roentgenological standpoint, an important observation was that, normally, visible peristalsis occurred only over the pyloric portion of the stomach, the food being repeatedly driven into the pyloric end, which acted as a blind pouch, and then back into the main part of the stomach; suitably prepared chyme being pushed periodically through the pyloric ring in jets. A selective action, in the matter of material passed on into the duodenum, was shown.

Dr. Skinner then read his own paper, "Fluoroscopy of nondeforming diseases of the stomach and duodenum."

Referring to the first two papers of the symposium, he said he believed that the use of any diagnostic agent depends upon its availa-

bility for the masses, through practitioners or specialists, as you please, and that serial plates, upward of two dozen, can only be afforded in private practice for patients of wealth; and he, personally, could not make his expenses if he used any such method. He was referring to the practicability of the fluoroscope for obtaining the same information. His paper dealt chiefly with the neuroses, and his conclusions were that clinical symptoms and clinical histories must be correlated with radiographic appearances. He pointed out that nondeforming lesions of the stomach are wrapped up in the vicissitudes of the pneumogastric nerve. Tuberculosis of the lungs, delayed resolution in pneumonia, mediastinal disease, cardiac affections, pancreatic conditions, chronic appendicitis, etc., may produce hypermotility or hypomotility of the stomach. Diagnostic points are continued appearance of spasm on repeated examinations and after milk diet, and evidence of duodenal irritation. Spasm, due to reflex causes, usually subsides when a patient is put on milk.

Dr. A. W. Crane, of Kalamazoo, Mich., read a paper on "The stomach as a reflex organ."

His conclusions were that perfection in the diagnosis of gastric conditions is to be gained by looking for causes for the interpretation of roentgenographic findings, outside as well as in the stomach, and that, if interpretation of plates is based on assumption of causes existing solely within the stomach or duodenum, many mistakes are bound to occur. We must be careful to distinguish between intrinsic disease of the stomach and reflex disturbances from other organs. Gastric reflexes can emanate from the gall bladder, bile ducts, pancreas, duodenum, toxemias, decayed teeth, heart or pulmonary disease, gynecological and obstetrical affections. Reflexes are manifested in roentgenological methods by incisura, changes in outline, spasms, increased or decreased peristalsis, too rapid emptying of the stomach, or a six-hour residue. Reflex disturbances, long enough continued, may give rise to organic lesions.

Dr. A. Howard Pirie, of Montreal, Canada, read a paper entitled "Indications afforded by X-rays for and against operation in diseases of the stomach, and results of such operations."

Operation is indicated for chronic gastric ulcer with hour-glass stomach, particularly where an ulcer shadow is seen. Persistence of the ulcer shadow, with a bubble of gas above it, four hours after the barium or bismuth meal, is quite characteristic. When gastroenterostomy was done on dogs without closing the pylorus, the result was not a success. It is fair to assume that the pylorus should be closed at operation. Roentgenograms, made in cases where operation has failed, have shown the bad effects of open pylorus by demonstrating

vicious circles. When done at a distance, plates show that residual food remains between the new opening and the pylorus. The gastroenterostomy opening should be made near the pyloric end of the stomach. In the acute gastric ulcer, delay in emptying of the stomach is a valuable sign. In the case of carcinoma, an eaten-out appearance, if extensive, contraindicates operation. An indented appearance is characteristic, but cases do not usually appear for examination early enough to show typical fingerlike indentations, which are most characteristic of cancer. No food should be given after the barium meal until examination of the stomach is completed; lack of peristalsis may cause delay in emptying, and barium, mixing with the new meal, may give a six-hour residue where there would have been none if no more food had been taken into the stomach. Gastroptosis is usually seen in cases of poor health and in neurasthenics. The condition does not call for operation itself, but it often goes with pyloric obstruction, and that may call for operation. It is to be remembered that tumors outside may press upon and change the outline of the barium-filled stomach, notably a pancreatic cyst or a large spleen. Stenosis of the cardiac opening is easily diagnosed by filling the esophagus and by the small entering stream. Foreign bodies that can pass from the esophagus can pass the pylorus, as a rule. Adhesions involving the stomach can be recognized directly or indirectly—directly by an appearance of hour-glass stomach. Indirect evidence is got when the pylorus lies higher than usual and food escapes more quickly than usual. The stomach atrophies from disuse, grows small, and is high. Sometimes this condition is found with cancer destroying the pylorus. The stomach may be small and situated high, with gallstones. Finally, the normal stomach presents many anomalies. Eight-hour delay in emptying may be found in neurasthenics. The splenic flexure, when distended with gas, may press on the greater curvature. The whole alimentary track should be examined. The appendix may be the cause of stomach symptoms. Dr. Pirie made a strong plea for medical treatment in many cases, not taking it for granted that exploration should follow the roentgenographic examination. In many cases advice can be given as to diet, habits, etc.; and this can often be made forceful by showing the patient that his stomach is full and distended four hours after a meal, and that it is manifestly improper to put more food into it after such an interval.

Discussion.—Dr. Pfahler said the confident diagnoses of duodenal ulcers were startling, and that he was surprised to find that they were being made in the way Dr. Cole and Dr. George apparently succeeded, according to operative findings. He said it seemed a pretty bold step to make negative diagnoses. He, personally, has not attached quite so much importance to the appearance of the cap.

He believes pressure by gas is important here. Gas may tie the splenic flexure up into a knot, and so, in the duodenum this may occur.

Dr. Case said he could not report as confidently on duodenal ulcers as Drs. Cole and George. Many of his plates, to be sure, have shown unmistakable lesions. He is confident the same lesions could be shown with fewer plates than Cole or George use, or even by fluoroscopy alone. He doubts the necessity for the large number of plates, and he always combines the fluoroscopic method with the making of plates. He said he had seen the appendix in over three hundred cases with the fluoroscope, and later verified his findings with roentgenograms. He doubts the statement of the serial-plate men, using a large number of plates, that their results can not be obtained without using their methods. He remarked that he had seen a number of cases, after gastroenterostomy, of penetrating ulcer on the lesser curvature with hour-glass stomach.

Dr. F. H. Baetjer said he thought enough stress had not been laid on peristalsis in the question of duodenal ulcer. There is marked peristalsis with spasm of the pylorus and spastic closure, ordinarily, in the case of stomach ulcer, and the stomach does not empty readily. With the duodenal ulcer, we do not have the spastic closure of the pylorus, and the stomach does empty itself readily. These conditions obtain with fresh ulcers. In the presence of duodenal ulcer the stomach often empties itself in 30 to 45 minutes. It seems to him that, if the roentgen method of diagnosis has any value, we should draw conclusions from the X-ray plates alone, without any other help, such as symptoms or clinical course, for in that way, both the possibilities and the limitations of the method are likely to be brought out best. Of course, in making the whole diagnosis, everything should be considered. He said he assumes that a clinician does not want his clinical diagnosis. The problem of diagnosis should be attacked from a standpoint of how much we can actually see in our plates.

Dr. Johnston believes we will come to the combined method. In some cases, undoubtedly, a definite diagnosis can be found. He believes that even mucosal lesions without any deeper affection will cause changes in the mechanism of the pylorus and duodenum that can be recognized absolutely by serial radiography or skillful fluoroscopy, but some men can not see much on the fluoroscopic screen anyway, and for such the fluoroscopic method has no value.

Dr. Pfahler decried the tendency to speak of fluoroscopy as the German method, and of plate making as the American method. He said, "Let us not belong to any so-called school; the combined fluoroscopic and radiographic method, it isn't anybody's school; it is the method of examining the gastrointestinal tract."

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Dr. Case mentioned two cases. In one, ulcer of the stomach was diagnosed, and a large hemorrhage occurred before operation. No ulcer was found at operation. The patient died shortly after, and, upon opening the stomach, only a pin-point ulcer was shown to be the cause of death. In the second case, an ulcer of the duodenum, just outside of the pyloric ring, was diagnosed. At operation no ulcer was found, but an hour later hemorrhage of a quart occurred.

Dr. A. L. Gray stated he had made a few correct diagnoses, and many that were incorrect. He mentioned a case of carcinoma of the stomach, in which, after making a series of plates, he reported no evidence of any tumor or ulcer of the stomach. A gastrologist reported colloid carcinoma, from washings through the stomach tube. At operation a colloid carcinomatous mass was found on the posterior wall of the stomach, at the end of the fundus, about the size of a Lynnhaven oyster. There were no indentations of the bismuth shadow in this case.

Dr. Cole, in closing the discussion, agreed that there should be no fight as to methods. "As for the cheap method, if you have made a few scattered plates, you haven't done anything. You have got to do all the cases radiographically, for the poor as well as the rich. Put the fee on for the rich; make it according to the purse, but not according to the purse strings. Tell the patient what the examination will cost him before it is made. He may call you a robber, but he will be back the next day for the examination; a few hundred dollars mean nothing to a rich man when the question of a serious lesion in the stomach arises." If the patient is not informed as to the fee until afterwards, one may have difficulty in collecting it. Serial radiography should not be applied to a number of plates made at different times while the food is passing through; it means plates made in rapid succession. "The whole secret is, do everything, do fluoroscopy if you want to; I do, myself, in a protected manner." He wants his plates as records to study, to study for an hour, if necessary. He said the only satisfactory way for him was to put the series of plates up in a long illuminator, so he could run from one to another and make comparisons, without being obliged to carry the details of the different plates in his mind.

Dr. George said that in 63 operated cases he had failed to diagnose 3, and probably 5 others. He criticized the Germans for sticking to the symptom-complex method.

SYMPOSIUM ON THE INTESTINES, COLON, AND ILEO-CECAL REGION.

Dr. George H. Stover, of Denver, Colo., read a paper, entitled "Roentgenographic evidence of Jackson's ileo-colic membrane."

Differentiation must be made between Jackson's membrane, adhesions, and other membranes. He said different appearances in

the region of the cecum were to be seen than in cases in which this membrane does not exist. The caecum is bent in the form of an arch with the convexity toward the median line. He showed lantern slides, made from plates, but appearances pointed out were not very definite. It is doubtful if the condition can be definitely diagnosed by such evidence as he presented.

Dr. W. B. CANNON, of Boston, Mass., physiologist, read a paper entitled " Early use of the roentgen ray in the study of the alimentary canal."

This paper dealt chiefly with the history of roentgenological technique and early experiments from the time of the discovery of the X-ray by Wilhelm Conrad Röentgen in 1895. Some reference was made to physiology of the gastro-intestinal tract.

Dr. JAMES T. CASE, of Battle Creek, Mich., read a paper reporting further study of the ileo-cecal valve and the appendix. He considers that passage of a bismuth enema through the ileo-colic valve means incompetency of the valve. In a series of 1,500 cases examined he found incompetency of the valve in 250. Many of them occurred after bismuth examination of the stomach. He thinks diarrhea is not usual, as was formerly thought, but as a rule intestinal stasis is found. In the majority of cases ileo-stasis is due to incompetency of the valve, and where a Lane's kink is present it is probably a coincidence rather than a cause of stasis. Normally, there is stasis of the ileum to some extent during digestion. He considered three main pathological causes for ileo-stasis: (*a*) Spasmodic contracture of the valve, (*b*) incompetency, and (*c*) ileal adhesions. Adhesions must be determined by X-ray as to whether surgical treatment is required. His work has taught him that X-ray evidence is of considerable value in chronic appendicitis. When the lumen is open, as it is in a large percentage of the cases, the size and length of the appendix, positive kinks, drainage, and emptying time can all be determined. The appendix was demonstrated in 254 cases out of 763 examined. When the appendix empties itself readily it is of little consequence, but when the shadow remains for several days or weeks it is a dangerous appendix. He concludes that cases are important when we have symptoms of intestinal toxemia. One sign of ileal stasis is gas in the small intestines. In a few cases a Lane's kink seemed to be the cause of stasis.

DISCUSSION.—Dr. PFAHLER said, in considering a diagnosis of short mesentery for the colon, we must remember that the transverse colon is held in high position, at times even above the stomach. by distension of the small bowel. As for the discovery of Jackson's

membrane, "Personally I have not made this diagnosis." In regard to ileo-cecal incompetency, it may occur from stagnation of the contents of the colon, lasting for some time. It is also demonstrated by clysters that after emptying the bowel or straining at stool sometimes bismuth will pass the ileo-cecal valve when it has not done so before. Spasm of the valve will cause marked retention of a bismuth meal.

Dr. Case: Flatulence is suggestive of incompetency of the ileocecal valve. A kink that doesn't obstruct is of no importance. There are numerous kinks. The important thing is the question of stasis. The technique should be made to simulate, as much as possible, normal digestive conditions.

Dr. Cannon: The ileo-colic valve is a definite sphincter in dogs and cats. The question in man is still open. If there is actually a sphincter it is quite likely that it is managed entirely by conditions within the canal itself. We can not assume because the valve is incompetent for the bismuth clyster, that it is incompetent for food passing through in a normal manner.

Dr. H. Threlkeld-Edwards, of South Bethlehem, Pa., read a paper on intensifying screens and screen technique.

All elements give out their own peculiar fluorescent rays, under influence of the tube, just as they have their own peculiar spectroscopic rays. All elements act as the source of secondary X-radiance, but the rays are not visible and fluorescent except in the case of a few elements. The higher the atomic weight the more penetrating the fluorescent ray given off, the shorter its wave length, and the higher the frequency. Because of their fluorescent properties, three compounds are chiefly used for making screens: Barium platinocyanide, giving yellow fluorescence; calcium tungstate, giving bluish white fluorescence; and zinc silicate, which gives a yellow fluorescence. Calcium tungstate is the only one practically suitable for intensifying screens because light from the others is not rich in actinic rays. Screens are made by mixing calcium tungstate with an adhesive or agglutinating material, which is then spread evenly on cardboard. An amorphous salt is used at present and this is reduced to a very fine powder. Calcium tungstate, as made by different chemists, varies greatly in fluorescent properties, although having the same chemical formula. The fastest screen is the best screen. The best screen plates are made by underexposing, and tank or slow development is best. They should have a long stay in the fixing bath. Black celluloid cassettes are best for small plates, but aluminum must be used for large ones, as celluloid warps in hot weather. The screen should be permanently fixed in the holder, it being impossible to prevent injury of the delicate screen, in time, if

removable. The surface is best freed of dust by directing a stream of compressed air over it before loading. Brushing gently with a clean camel's-hair brush is the best substitute. The picture should be taken through the glass of the plate and not through the intensifying screen, and the sensitive side of the screen must be in perfect contact with the film of the plate. On account of the high molecular weight of calcium tungstate, even the thin layer on the screen offers more obstruction to X-rays than the glass. Good screens are expensive and much care should be given them. They should be frequently aired unless used daily. Screens are backed with celloidin, pyroxylin, or nitrocellulose. There is gradual elimination of solvents which soften the surface if they can not evaporate by free exposure to the air. Plates, by adhering to the soft spots, ruin the screen by permanently marking it. Of course, finger marks, or stains made by developing solutions, will ruin a screen, and great care must be used to prevent such marks. Plenty of space in the workroom is essential.

Dr. Leopold Jaches, of New York, N. Y., read a paper on pyelography.

He discussed present developments in technique in this field. There are two methods in roentgenological diagnosis of the genito-urinary system: (1) Without injection, and (2) by making roentgenograms after injecting the ureter and renal pelvis with solutions of certain silver salts. It has been found in many cases that, although calculus has been ruled out, symptoms have persisted. On account of this shadow-producing substances were proposed. Argyrol was first used, and the two most important substances now are 25-per cent solutions of argyrol and 25-per cent solutions of collargol. Argyrol is to be preferred because it is more soluble. There is danger of collargol precipitating in the kidney; but, probably, the chief danger with either is from over pressure. By the method of injection, hydronephrosis, pyonephrosis, kinks of the ureter, ptosis, tumor of the kidney, and, according to some, among whom is Diehtling, also tuberculosis of the kidney can be demonstrated. Injection of the bladder with 25 per cent solution of argyrol gives certain information that can not be obtained in any other way. With air one can not get as good a demonstration of the pelvis and calices of the kidney, nephroptosis, dilated pelvis, etc. He showed lantern slides of normal and abnormal kidneys and ureters injected with argyrol solution.

Dr. William S. Newcomet, of Philadelphia, Pa., read a paper reporting two cases of Raynaud's disease successfully treated with X-rays. Pain, in both cases, was relieved promptly, and the ulcers healed. A full skin dose was given three times a week for about six months.

Dr. George Pfahler, of Philadelphia, Pa., read a paper entitled. "The use of the roentgen ray in the treatment of gynecological conditions."

This was stated to be the last field invaded by the roentgenologist. To-day it probably holds first place, so far as definite and satisfactory results are concerned. The theory of the action of X-rays in pelvic conditions includes the belief that the ovaries and testicles are the most sensitive of all organs to X-ray effect, and they can be affected without action on the overlying skin. In this way, uterine fibromata can be influenced. Depression of ovarian function, with suppression of the menstrual flow, results in slowing the growth of fibromata. Neurotic dysmenorrhea yields quickly. It has been found that progressively increasing doses give increasing effect on ovarian function, and that an artificial menopause can be produced in about a month with suitable X-ray dosage, in patients over 40 years of age. Under 40, more treatment is required to cause atrophy of the ovaries. After primary degeneration, regeneration of ovarian tissue takes place rapidly, if treatment is not pushed.

Roentgen rays give the best results, in the treatment of fibroids, in patients over 40. Decrease of hemorrhage is the first thing to expect. Occasionally, with submucous growths, or anemic cases, bleeding may increase after the first treatment, or series. The tumor, itself, is usually last to show any effect. Later, it decreases in size and continues to decrease long after discontinuation of treatment. Pressure symptoms disappear then. As to the question of malignancy, following X-rays, it can be said that there is no case on record. Pain, due to hypersensitive ovaries, is likely to be relieved early. Of course, this is not so with pressure symptoms. In the induction of an artificial menopause, treatment, advisedly, should be carried on after amenorrhea occurs, in order to make it permanent. Inflammatory diseases of the adnexa have also been treated with gratifying results, with 98 to 175 milliampere-minutes.

Technique in the treatment of gynecological conditions: A uniform current of high voltage is demanded. Penetration should be 7 to 8 on the Benoist scale. Water-cooled tubes are most satisfactory, and the distance from target to skin should be 8 inches. The rays are confined to one area as much as possible, and the field of application is varied. The same skin area must not be exposed oftener than once a month. Pfahler divides the lower abdomen into three areas, and a fourth area is on the perineum. He gives treatment through two areas one day, and through the other two on the succeeding day. Frequency of treatments varies with circumstances. Dosage should be controlled by a pastille at the skin distance. The full dose, on the skin, is 10x for one area, and an area of skin should not be exposed again in less than three weeks;

40x is given in each series. Treatment lasts from five to six months but the duration can be reduced to three months with powerful apparatus and short, intensive treatments. Exposure time varies from five to twenty minutes. Filters should be used. Sole leather serves well, but it is best to add 2 or 3 mm. of aluminum. Skin effects have been of no consequence but a severe burn can be produced with carelessness. Freiburg places the target 15 cm. from the skin, and uses the method of intensive cross-fire at the pelvic organs, through many small areas, marked on the skin with wax pencil. The series, forming one treatment, takes six hours and amounts to a dosage of 300x. To Dr. Pfahler, no therapy has been so uniformly satisfactory as this line of work.

Dr. George M. McCabe, of New York, N. Y., read a paper which dealt with therapeutic technique in general.

He gave his technique for measuring X-rays, with specific reference to intensive treatments. Proper dose depends upon both quality and quantity of X-rays. For determination of quality he uses a combination of the Benoist penetrometer, qualimeter, and milliamperemeter. Practically the qualimeter gives no more information than the parallel spark gap. He always employs hard rays for therapeutic purposes, and he has obtained the same results with both coil and transformer. High tubes emit sufficient soft rays to affect the skin all that is necessary. He employs a Benoist 9 or 10 ray and never lets the penetration fall below Benoist 7. Three weeks must elapse between massive doses; six weeks if there has been any reaction. It is well to begin with fractional doses spread over a period of three weeks. Quantity is determined by current volume and action on Sabouraud pastilles. Two conditions may result in an overdose—idiosyncrasy and hypersusceptibility. The cause of the former is unknown and its existence is doubtful, or at least, very uncommon. Blonds, females, and children are more susceptible than other subjects.

Mr. Sydney Lange, of Cincinnati, Ohio, read a paper on recent X-ray therapy of the thymus.

Artificial resolution of the thymus can be produced by X-rays, and atrophy can be brought about in comparatively short time. X-rays cause reduction to a fibrous shred. In a series of 30 or 40 cases prompt cure resulted in every case. This is against a mortality of 33 per cent after operation. Involution begins in less than three hours after the first treatment. One massive dose in milder cases may bring about symptomatic cure. The question of regeneration of the gland after cessation of X-ray treatments is to be considered, but that is offset by the fact that incomplete thymectomy is also fol-

lowed by regeneration, and complete thymectomy is fatal, so operation on this plea is no better than X-ray therapy. In fact, results in all cases treated have been so uniformly satisfactory that the question is raised whether it is not policy to have all young children and infants who show symptoms of, or suggestive of, large thymus examined by screen or radiogram and treated if the condition is found. There is no telling how many disasters, later in life, may be prevented by removing the tendency to status lymphaticus and other states, due to persistent function or hyperfunction of the thymus.

Dr. William H. Stewart, of New York, N. Y., reported a case of fracture of the skull with air in the lateral ventricles. Anteroposterior and right lateral plates, which he exhibited, showed dark areas of considerable density, completely outlining the ventricles.

The patient sustained an injury over the right eye November 24. Right lateral radiogram showed a linear fracture of the skull, just over the right eyebrow. He recovered quickly and left the hospital in two weeks. December 12 he was readmitted with history of severe headaches, vomiting, dullness, and listlessness. His understanding was good. December 14 he was examined by a neurologist, who found him conscious, but in a state of mental confusion, with slow cerebration. No aphasia or tremors, and no tenderness over the skull. Pupils reacted normally; knee-jerks were increased. Diagnosis: Increased intracranial pressure; probable abscess. He was radiographed again, with results shown in the plates. Communication had been established through the fissure in the skull between the right ventricle and the cavity of the nose. Repeated blowing of the nose had forced air into the lateral ventricles until they had become distended.

Dr. Hill read a paper, prepared by Dr. George F. Thomas, of Cleveland, Ohio, on diseases of the chest, with special reference to the mediastinum.

The paper was illustrated with lantern slides. Differential diagnosis of aneurysm, mediastinal tumors, and lesions of the esophagus was considered. Some of the points were, that appearances on a plate might be very deceptive, and that stereoscopic plates are very useful. A lateral plate may give the deciding information. In some cases fluoroscopic examination may clear up any doubt after plates fail. Broadening of the shadow at the base of the heart may not be due to aneurysm. Horizontal position of the heart was considered to be suggestive of dilated arch of the aorta, or aortitis with lengthening of the aorta. Under fluoroscopic examination, pulsations and position help to differentiate conditions of the aorta from fixed tumors. Bismuth in the esophagus outlines that organ, and

such conditions as diverticuli can be diagnosed easily. The subject of artificial pneumothorax was touched upon.

Discussion.—Dr. Baetjer, of Johns Hopkins, said the difficulty, in many cases, of producing artificial pneumothorax was due to adhesions preventing collapse of the lung. Pressure alone is not sufficient guide for the amount of gas forced into the chest. The only safe control is the use of the roentgen method, combined with a pressure gauge. Trusting to subjective phenomena may put the patient in a dangerous condition. While lying on the table, he may feel all right and not show any distress, only to collapse upon getting up. Adhesions may prevent collapse of the lung, even under considerable pressure, when the patient is lying down, and, later, they may give way suddenly. Such difficulty and danger is overcome by using the fluoroscope as a check on the operation. Referring to cardiospasm, he said he believes it is closely associated with prolapse of the stomach.

Dr. Pfahler said that horizontal position of the heart may be due to other causes than diseases of the aorta. There is danger in diagnosing beginning aneurysm from broadening of the upper part of the heart shadow. It may be due to tortuosity of the aorta. Aneurysm is rarely confined to the arch but, almost always, extends farther down the aorta. Early dissecting aneurysm may only be recognized by fluoroscopic examination with careful changing of light and position.

Dr. Walter J. Dodd, of Boston, Mass., made a preliminary report of the work which is being done at the Massachusetts General Hospital by Dr. Holmes, Dr. Shattuck, and himself on teleroentgenology of the chest in the diagnosis of heart lesions.

So far they have been occupied chiefly in checking up the work previously done in Germany. Their cases have been examined at a distance of 7 feet from the X-ray tube. Plates made at this distance, or the fluoroscopic orthodiagram, give the cardiac outlines and measurements more accurately than clinical methods. The shape of the chest is a matter of great importance in determining position of cardiac impulse by inspection or palpation. Where, on account of the shape of the chest, percussion and palpation show the apex of the heart to be outside the nipple line, X-rays will show it to be inside if the heart is not really enlarged. Use of X-rays will educate a clinician to more accurate percussion. Necessity for having the tube always in a definite position in relation to the patient's chest was investigated, and it was found that variations in the position of the tube, a foot from side to side or up and down, made no difference whatever at the 7-foot distance.

Dr. G. B. Shattuck spoke of teleroentgenology from the clinical standpoint. He discussed physiological variations of the heart and chest, and methods of percussion. He has mapped out the cardiac position in all the cases worked upon at the hospital, and his percussion boundaries have been marked with lead wire, secured in position with adhesive plaster for the X-ray examination. His conclusion is that the results of percussion can be made much more reliable by checking with the orthodiagram or plates. The plates presented for inspection showed that his percussion boundaries agreed much more closely with the real size of the heart in recent cases than was shown by plates of earlier cases. Variation in heart shadows is due to individuality, sex, age, inspiration, expiration, etc. The heart outline has individual characteristics. Percussion can be checked by teleroentgenology because this method is mechanical and not subjective. There are errors, however, and no method of measuring the heart is truly accurate. Slight hypertrophy, without dilatation, can not be demonstrated either by percussion or shadow. He believes teleroentgenology is an important aid to clinical medicine.

Dr. George C. Johnston, of Pittsburgh, Pa., reported his work of investigation of the pituitary gland by roentgenological methods in cases of epilepsy and pituitary disorders.

There was no uniformity in the findings in cases of primary cerebral epilepsy, but in certain cases of epileptic or epileptoid seizures, beginning in early adolescence, without history of any previous disturbance, he found quite frequently a condition of enlargement of the posterior clinoidal processes with partial or complete roofing over of the sella turcica. Such conditions very probably cause pressure on the pituitary body; if not under ordinary conditions, certainly at times when, by congestion or hyperaemia, more space is required. By hypertrophy or elongation of the posterior clinoidal processes, or the anterior processes, or both, a partial roof is formed over the sella turcica, and the pituitary substance is more or less inclosed in a space which normally is free and open above. This results in constriction and pressure from time to time when by various physiological changes the gland increases in size and demands more room. A series of cases showing these roentgenographic appearances was studied, and they agreed pretty closely in clinical phenomena. They were all cases of more or less typical or atypical epileptic seizures, appearing for the first time in adolescence or early adult life.

In cases where deformity of the clinoidal processes with partial closure of the free space over the sella turcica was found, pituitrin or pituitary substance was administered in therapeutic doses. It was found that such treatment had little or no effect in controlling seizures, but if sodium or potassium bromide was given with the pituitary preparation, prompt relief was afforded quite uniformly.

After cessation of epileptic seizures, use of the bromides could be discontinued, and patients were free from symptoms so long as daily administration of the pituitary preparation was continued. When the pituitrin was also withdrawn, attacks began again, and then it was necessary to begin a new course of treatment with bromides and pituitrin combined.

The conclusions were that there are certain cases of epilepsy, not to be distinguished by clinical phenomena from primary cerebral epilepsy, but coming on later than childhood, and that these cases can be relieved or kept free from symptoms by the judicious administration of pituitary preparations. Cases of epilepsy should be investigated for deformities of the sella turcica, and if found, appropriate treatment should have a fair trial. Familiarity with the normal clinoidal processes is necessary. One associates with the normal sella turcica a space of a certain size, and while the shadows of normal processes show variations in their curves, yet it is not a normal picture to have extension forward or backward of the processes, resulting in a rooflike profile. In such cases of epilepsy described, there is no enlargement of the sella turcica space, which, if anything, is likely to be smaller than normal. The picture is quite contrary to the typical appearances in acromegaly, where a greatly enlarged sella turcica is shown in shadow. Here there may be hypertrophy of the anterior clinoidal processes associated with enlargement of the anterior lobe of the pituitary body.

Dr. Sidney Lange, of Cincinnati, Ohio, reported the present status of X-ray methods of examination in mastoiditis.

Roentgenological examination seems destined to become a part of the routine examination of mastoid cases. Roentgenographic appearances, or X-ray lesions of the mastoid, fall into three divisions:

(*a*) *Acute.*—In mild cases of acute mastoiditis the cell spaces can be seen, but they are clouded. In severe cases there are changes in the bone structure; the bone shadow itself is cloudy and the spaces are indistinct. In necrotic cases the plate shows breaking down of bone structure and immediate operation is indicated.

(*b*) *Chronic.*—Simple sclerosis is a healing process, and is shown on the plate by a smooth bone shadow and by prominence of the lateral sinus. Sclerosis, with bone defects or bone cavities, results in areas of lessened density due to cholesteatoma or absorption, and chronic inflammatory changes usually accompany such pictures.

(*c*) *Healed.*—Plates show normal bone and cell space shadows or simple sclerosis completed.

It is necessary to acquire familiarity with normal mastoid appearances, and plates should be made of both mastoid regions in every case for the sake of comparison in cases where only one side is diseased.

Dr. Preston M. Hickey, of Detroit, Mich., read a paper on roentgenographic examination of the head in children.

He laid stress on the importance of making stereoscopic plates, and exact technique as to the amount of lateral displacement. Such examination will disclose various cranial defects and abnormalities. Even lesions of the brain and soft tissues are often revealed. Brain tumor seldom in itself is dense enough to record its presence on the X-ray plate, but whenever there is local increased intracranial pressure the adjacent bone of the skull undergoes changes which can be shown. The skull bone is quick to undergo rarefaction in lime salts as the result of continued pressure, even though it be slight, and areas of lessened density are very apparent, particularly by stereoscopic radiography. In cases of hydrocephalus or other long-continued causes of general increased intracranial pressure it is not uncommon to find plates showing plainly all the markings of the brain convolutions. Occasionally a brain tumor will of itself cast a definite shadow. Stereoscopic plates will show head injuries clearly, even small fissures. However, suture lines vary considerably in children, and suspected lines of fracture must be carefully differentiated. The head must be carefully immobilized during exposure, and this is sometimes accomplished with difficulty in the case of children.

Dr. Alfred L. Gray, of Richmond, Va., discussed "Roentgenography in head injuries."

He described his technique of immobilizing the head and preventing movement, due to respiratory motion, by bandages across the head, held in place by heavy sandbags. He laid emphasis on the importance of making stereoscopic plates in doubtful cases of fracture and the necessity for differentiating from the numerous normal linear markings of the skull.

With this paper the scientific program ended.

NOMENCLATURE.

The following nomenclature, suggested by the executive committee, was adopted by the society:

Roentgenography; that specialty in medicine which makes use of roentgen rays.

Roentgenology; similar to the above but including the study of the roentgen ray.

Roentgenologist; a physician learned in the physics of the roentgen ray, but not necessarily a worker with it. Usually it will mean practice in the use of the rays.

Roentgenograph; apparatus used.

Roentgenogram; the photographic product.

ROENTGENOSCOPY; view with the roentgen ray.

ROENTGEN-FLUOROSCOPY; fluoroscopic examination with roentgen rays as the source of light.

ROENTGEN-DIAGNOSIS; diagnosis by means of roentgen rays.

ROENTGEN-THERAPY; treatment by means of roentgen rays.

ROENTGEN-IRRADIATION; exposure to roentgen ray.

ROENTGENISM; to suffer from the effects of roentgen rays.

ROENTGENIZATION; use of roentgen rays in diagnosis and treatment.

After some discussion, it was voted not to adopt the term ROENTGENOGRAPHER. There would seem to be a place for this term, as it is particularly suited to those who are doing X-ray work in many hospitals, and to those who are not graduates in medicine. Some members of the society themselves have just such assistants. The discussion was trivial, being based apparently on the idea that the term suggests professional inferiority and by mistake might be applied to themselves. Doubtless the term will find its way into common use in spite of not being officially adopted by the American Roentgen Ray Society.

The specific meaning of ROENTGENOGRAPH (verb) is "to make a roentgenogram." ROENTGENOGRAPHY means the art of making roentgenograms. The root, ROENTGEN, is to be pronounced rentgen, with the "g" hard.

The following officers were elected for the ensuing year:

President, Dr. Sidney Lange, Cincinnati.

Vice presidents, Dr. D. D. Talley, Richmond, Va., and Dr. Albert Soiland, Los Angeles, Cal.

Secretary, Dr. W. F. Manges, Philadelphia, Pa.

Treasurer, Dr. Leonard Reu, Buffalo, N. Y.

Executive committee: Dr. Alfred L. Gray, Richmond, Va., chairman, Dr. George C. Johnston, Pittsburgh, Pa., and Dr. Roland Hammond, Providence, R. I.

The next annual meeting will be held in Cleveland, Ohio.

Description and Discussion of Manufacturers' Exhibits, Fourteenth Annual Convention, American Roentgen Ray Society.

It is a significant fact, indicative of modern requirements, that all manufacturers who had apparatus displayed for demonstration, showed the transformer type of machines, giving a rectified or unidirectional current as the output for the X-ray tube circuit. No induction coils were seen. The Campbell Electric Co. showed high-frequency coils for portable use. Mr. S. Cabot, of Brookline, Mass., exhibited his new direct-current high-potential machine, and, on account of his rather unique application of electrical laws and prin-

ciples to generating apparatus for the production of X-rays, space will be given below to a description of his apparatus in some detail.

The following transformers, or so-called interrupterless type of machines, were demonstrated: Snook, Kny-Scheerer, Wappler, Scheidel-Western, Waite & Bartlett, Victor, Campbell, and Cabot.

Exhibitors were limited to direct current, 220 volts, so no observation could be made of the types and makes of synchronous motors used by the various manufacturers in their machines designed to be operated with alternating-current service. The synchronous motor is an important problem in such a transformer, and no small part of the efficiency of the apparatus depends upon it. Capacity of the transformer machines examined, depended upon the winding and kilowatt ratings of their respective rotary converters, inasmuch as they were all wound for and operated on a direct-current service of 220 volts. Comparison of capacities of the different makes to supply kilowatt energy to an X-ray tube is hardly fair, because the machines varied in power ratings given them by their manufacturers from 4 kw. to 12 kw. Nevertheless, occasion was taken to try most of the machines present with known tested X-ray tubes, Mr. Henry Green, of the Green & Bauer Co., and Mr. Charles Campbell kindly lending tubes for this purpose.

The machines are all similar in principle but differ in certain details, such as fixed or variable inductance in the primary circuit, open or closed core transformer, solid or liquid insulating material, etc. Each of the machines has a rotary converter or generator, which supplies single-phase alternating current of 60 cycles to a step-up transformer. Coupled to the shaft of the motor, and turned at exact speed with it, each has a revolving rectifying device, or switch, as some prefer to call it, for commutating the high-tension current in the secondary circuit. Rectification means that both of the alternating-current waves of each cycle are delivered to the same binding post on the cabinet containing the apparatus. This binding post becomes the positive pole of the machine. It thus happens that all of them supply essentially the same form of energy to an X-ray tube in operation; that is, a unidirectional interrupted current composed of 120 impulses per second, with a potential upward of 100,000 volts. X-ray tubes behave much the same when lighted by any of them. Some of the transformers have the primary coil wound for a fixed ratio that can not be changed by the operator. Others have what is called variable inductance, which means that the primary coil is available for use in sections, taps coming off and leading to a suitable polycontact switch, so that several different ratios can be used between the number of turns in the primary and the number of turns in the secondary coil—1 to 500, 1 to 600, etc.—thus controlling voltage in the secondary circuits more or less independently of

putting heavy currents through the primary circuit. All the machines have switchboards for operating the apparatus, some on the sides of their cabinets, and some on portable tables. Output from their secondary coils is controlled by having either resistance or reactance in series with the primary A. C. circuit of the transformer.

Much alike in essentials, the machines differ in appearance, details of construction, and special features. Each manufacturer claims, and stands ready to prove to the superficial examiner that his interrupterless transformer is superior to all others in virtue of some one or several particular features of his own design or construction.

THE CABOT HIGH-POTENTIAL D. C. CONVERTER.

The Cabot machine is the result of much experimenting and it has been largely modified at least twice before reaching its present shape. Even now it is somewhat more bulky than the ordinary machine of anything like the same capacity, and the manufacturing cost is high. However, the 7.5 kw. machine for either direct or alternating currents is on the market now at a list price of $1,000. A 15 kw. machine is being prepared for listing at about $1,500.

The essential features of the direct-current machine are as follows: A direct-current motor turning a long shaft which carries three rectifying disks for commutating the high-voltage secondary currents, and beyond them separate disks for modifying the low-voltage primary current. These occupy the upper compartment of the composite cabinet. In the lower compartment there are three transformers, or rather three sets of windings, a condenser, and reactance coils. With this machine, transformer inductance does not depend upon an interrupted or alternating primary current. Magnetization of the core is due to varying strength and potential of the primary current. The commutating disk in the primary circuit is responsible for this, and the result is an approximation to a unidirectional wave current; a series of steps upward to the maximum potential of the primary direct current, 220 volts, and then a series of steps down. This step-like rise and fall in potential is smoothed over, as it were, into what is more truly a straight line unidirectional wave current, by placing a condenser of suitable capacity in the circuit to afford elasticity, and sufficient impedance to augment the effect of the condenser.

The motor is small and it is regulated for a speed of about 1,800 revolutions per minute. It can be regulated within certain limits from the switchboard, but exact speed is not a matter of importance, because all disks are on the one shaft, and commutation in the secondary circuits is always in exact time with the primary wave.

There are three step-up transformers with one closed core. That is, there is one and only one closed magnetic circuit for all three

sets of windings. The primary coils are compound, giving a three-phase or a nine-phase secondary current. The first phase is obtained from the complete winding of the first primary coil. The second phase is taken from two-thirds of the turns on the first and one-third of the turns on the second primary coil. For the third phase one-third of the turns are on the first primary coil and two-thirds are on the second coil. The fourth phase is taken from the complete winding of the second primary coil. The fifth and sixth phases are derived from the second and third primary coils, just as the second and third phases are derived from the first and second coils. The seventh phase is taken from the third coil, and the eighth and ninth phases come from turns divided between the third and first primary coils. The ratio of ampere turns is the same for each phase, and the calculated potential is for a secondary current of 100,000 volts. In operation, the secondary induced current from this system of transformers is a true (nine-phase) polyphase alternating current. This current then has to be commutated, and that is accomplished by appropriate revolving disks on the motor shaft, constructed of suitable dielectric material, much after the fashion in which the single-phase alternating high-potential current is rectified in all the ordinary interrupterless transformers described above. In the Cabot machine, however, commutation is practically that of a direct-current generator or dynamo, and the secondary output is a continuous direct current with practically nonfluctuating voltage. There is a ripple amounting to 4 per cent for the direct-current machine, but that is insignificant in operating an X-ray tube, since the pressure is at no instant less than 96,000 volts and the current is continuous. This converter is designed with suitable modifications for alternating-current supply, and it should give practically the same results. On the alternating current, fluctuation in voltage amounts to between 12 per cent and 16 per cent instead of 4 per cent. Experiments seem to indicate, however, that this difference is not manifest in the behavior of X-ray tubes. Probably by the use of suitable capacity and impedance this can be brought down to a ripple of 8 per cent.

The control panel or switchboard for the Cabot High Potential D. C. Converter contains—

A. Milliamperemeter to register current in the X-ray tube.

B. Voltmeter to indicate voltage across tube terminals at all times.

C. Ammeter to register current in the primary circuit; and since voltage is constant in the supply current, energy in kilowatts put into the machine or drawn from the wire can always be easily and accurately calculated.

D. Quantity lever (resistance regulator): This is a rheostat and it controls the current put into the X-ray tube. Manipulated in

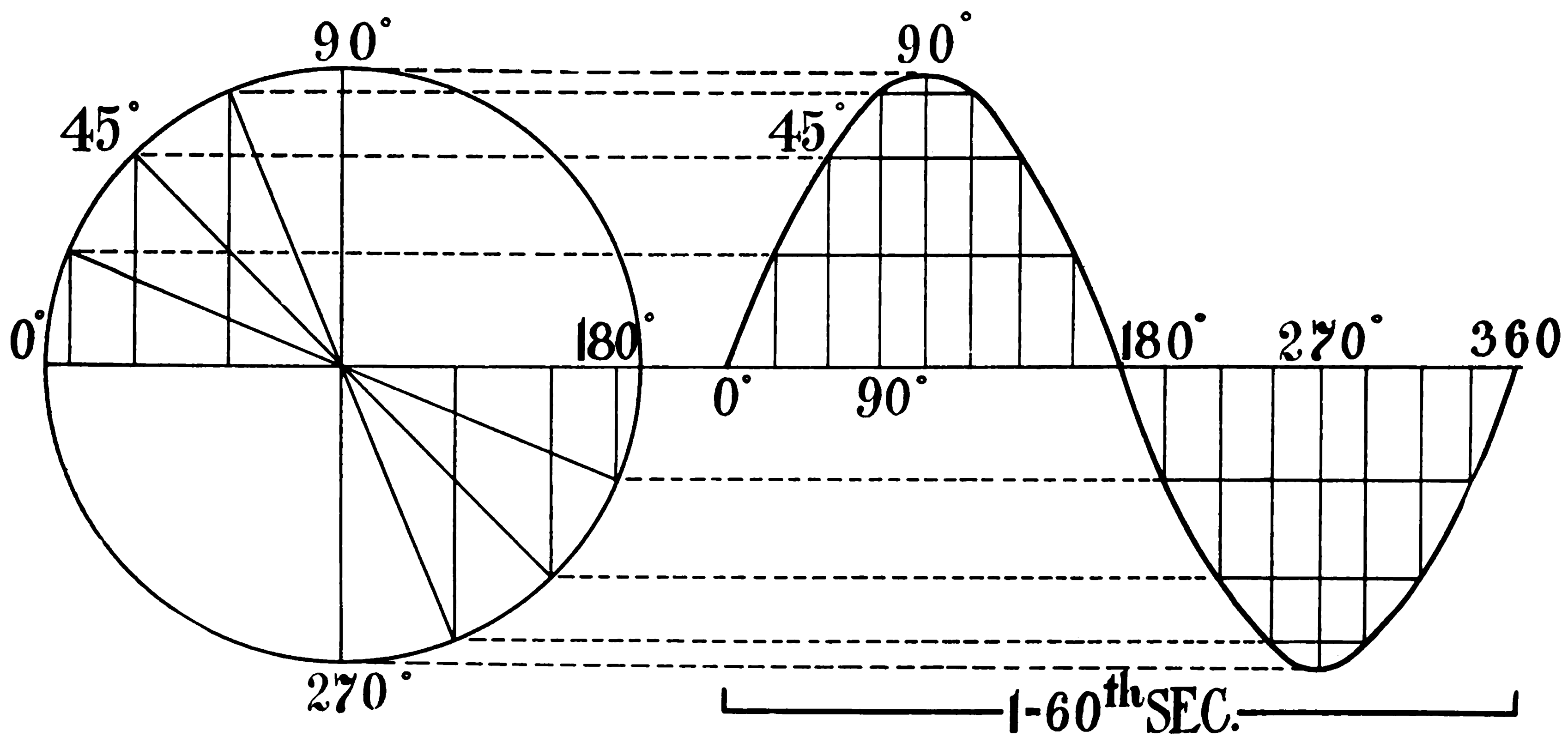


FIG. 1.—ALTERNATING CURRENT, SINGLE PHASE, 60 CYCLE.

One complete cycle, showing method of plotting the curves from a circle the radius of which represents maximum voltage. The sines of equal angles, 45°, 90°, etc. are plotted at equal distances along the base line corresponding to fractions of a second to the number of cycles, thus giving the sine curve of the potential.

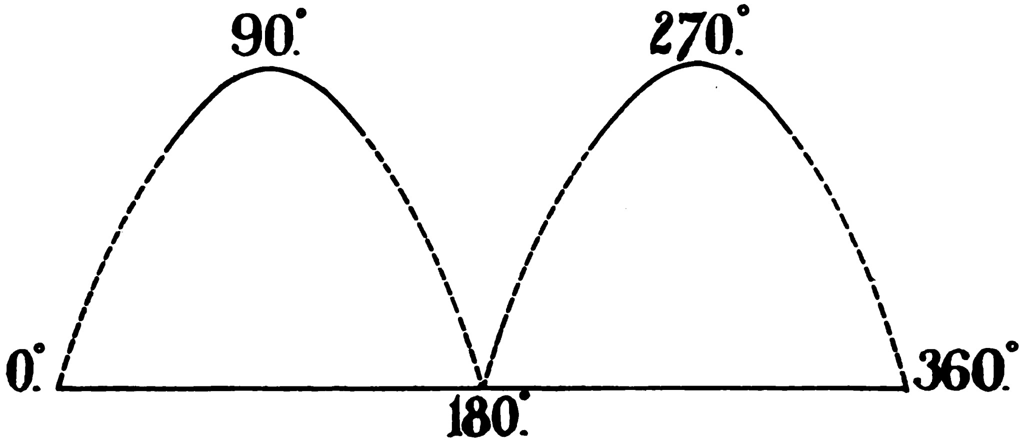


FIG. 2.—ALTERNATING CURRENT, SINGLE PHASE, 60 CYCLE.

One complete cycle, representing one-sixtieth of a second, after rectification by an interrupterless X-ray transformer. Forty-four per cent of each wave collected shown by continuous line. Unused portion of the wave represented by dotted line. The curves are not drawn so as to indicate the high voltage after transformation.

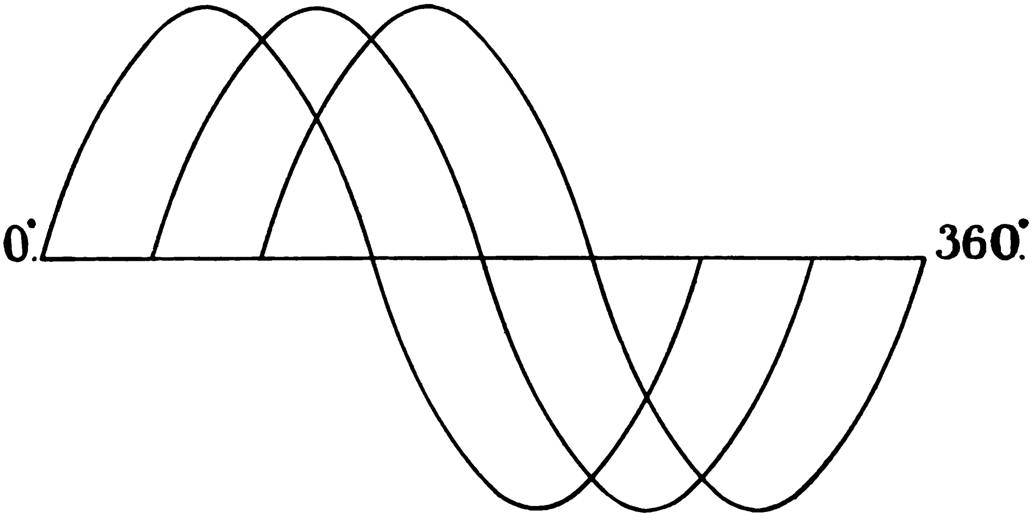


FIG. 3.—ALTERNATING CURRENT, THREE PHASE, 60 CYCLE.

One complete cycle drawn, showing six alternations, corresponding in time to one-sixtieth of a second.

conjunction with E, any number of milliamperes can be sent through the tube under any pressure desired that will light the tube. Of course, every tube has a definite lighting voltage, depending upon its vacuum and certain other qualities. A high tube will not light under a pressure of 30,000 volts, for instance.

E. Quality lever: This is a nine-point variable inductance switch and it governs the ratio of transformation. The switch has three arms, one for each of the three winding systems.

F. Operating switch, closure of which sends the current through the transformer and into the tube circuit.

G. Main current switch.

H. Starting box for the motor.

I. Automatic overload circuit breaker. This acts to protect the X-ray tube and it also saves blowing fuses.

J. Time switch.

K. Fluoroscopic adjustment switch. The current can be cut down or choked to 1 milliampere with any desired voltage across tube terminals.

Operation of the apparatus will be discussed below.

TRANSFORMERS.

The question of whether an open core or a closed core is best in a step-up transformer, designed for the production of X-rays, is a debatable one. From the standpoint of electrical efficiency, there seems to be no doubt that a closed magnetic circuit is by far the best. Electrical engineers are practically unanimous on this point, and transformers for commercial purposes are universally so constructed. With the open core, magnetic losses are relatively very great, and the use of a large mass of iron will not overcome the losses.

However, it is true that efficiency, expressed in terms of operating expense, is not altogether a matter of importance in the case of an X-ray machine. It matters nothing if it costs a fraction of a cent more per radiographic plate to operate an open-core transformer if the machine will actually make better plates or if it will injure an X-ray tube less. Results alone, under working conditions, must settle the question of desirability. Inasmuch as electrical considerations point to superiority of the closed core, it would seem that the burden is on the makers of open-core transformers to prove superiority for X-ray purposes. Statements made by manufacturers are often highly colored by advertising schemes and put out chiefly with the idea of creating demand in a field now crowded with keen competition. Many claims are made with the expectation that the

prospective purchaser will know little or nothing of the working principles of his electrical apparatus.

The combined claims of the manufacturers of open-core transformers practically amount to better form of current for the X-ray tube with less heating. The argument from the standpoint of one manufacturer is that with the open core there will be neither lag nor lead, and the transformer will keep exactly in step with the alternations of the current at all times and under all varying conditions, developing best X-ray effects. If the lag in the induced current occurred equally in both amperage and voltage it would be a matter of no importance, because, assuming that for best X-ray effects primary and secondary currents should be exactly in step, the high-tension commutating device can be adjusted to take care of all possible lag or lead. If it is a question of amperage lagging behind voltage, it is interesting to note that reactance is used in the primary circuit with this machine, and there must, therefore, be varying degrees of lag in the current passing through the primary winding. In the case of another the demonstrator, apparently coached from the factory, said there was considerable lag of amperage behind voltage in the secondary wave, and that much experimenting had been done to set the rectifying disk properly for it. If that is so for the open-core coil of one manufacturer it ought to hold for the open-core coil of the other. However, the apparently opposite views are not of much importance, because, so far as heating of the tube is concerned, it is largely a question of fluctuating voltage in each impulse and percentage of the whole wave collected. If maximum amperage could be caught in exact time with highest voltage, the rectifying switch being adjusted to collect only the crests of each wave, then there would be available energy for maximum X-ray production with minimum heat production, assuming, for the moment, that paths of conductivity through the bulb of an X-ray tube are easily adaptable to such a flat voltage curve—a voltage, however, that is abruptly interrupted 120 times per second. There is considerable evidence that nonfluctuating voltage with continuous current will produce excellent results in an X-ray tube, but it does not follow for the interrupted current, with continuously varying resistances in the X-ray tube. The lighting resistance of a tube is seldom as low as the running resistance, even when the tube is lighted as frequently as 120 times per second. Even if there were no lag in the current from the transformer of the first manufacturer, collection of the wave is not limited to the high amperage—high voltage portion. Instead, it is claimed that 44 per cent of the wave is collected.

Heat production in an X-ray tube is due to the kilowatt energy put into the tube, or more particularly to kilowatt-seconds. The

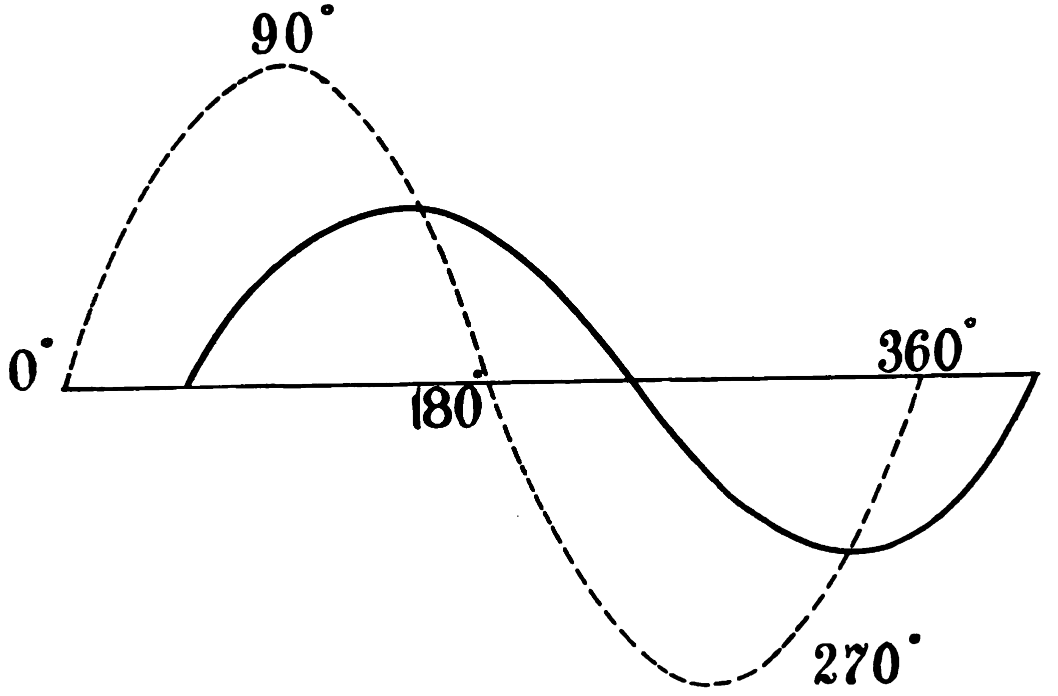


FIG. 4.—ALTERNATING CURRENT, SINGLE PHASE.

Diagram to illustrate lag resulting when inductance (reactance or impedance) is interposed in an alternating current circuit. Dotted line represents potential curve. Solid line represents ampere curve.

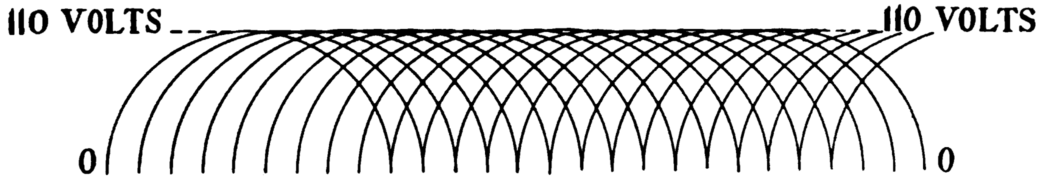


FIG. 5.—DIRECT CURRENT, ONE-SIXTIETH OF A SECOND, AS FROM A GENERATOR WHICH WOULD PRODUCE NINE-PHASE 60-CYCLE ALTERNATING CURRENT IF IT WERE NOT COMMUTATED INTO DIRECT CURRENT.

Note continuous flow of current under even pressure which scarcely fluctuates under the maximum, 110 volts.

greater the percentage of the wave collected, down to the points where current ceases to flow through the tube, the greater will be the total energy, expressed in kilowatt-seconds, and we should expect a larger percentage of energy to be converted into calories of heat, irrespective of whether the peak of the load is in exact time with the peak of the voltage or whether there is considerable lag.

A fact indicating that it is chiefly the percentage of wave collected that controls the number of kilowatt-seconds, or total heat production, is that a given tube will bank a definite voltage on the machine irrespective of potential as measured across an unbroken air gap. That is, with the rheostat or impedance lever on a certain point, the voltage may be, say, 100,000 volts, measured by the parallel spark gap or by a voltmeter, but with a lighted X-ray tube in series, the voltage across tube terminals will be only 70,000 or 75,000 volts, according to the vacuum of the tube. In view of this it would seem to be of litle importance if maximum amperage does lag a little in time. It will be available for conversion into X-rays anyway, and if the commutator is adjusted to collect an appropriate amount of the wave, including the high amperage portion, maximum X-ray conversion energy will be collected without useless heat conversion, within the limitations of this type of machine, giving an interrupted or pulsating current, no matter whether the core is open or closed. As a matter of fact, it is not practicable to limit wave collection to the small portion best suited to the production of X-rays with minimum heat production, and we find manufacturers of both closed core and open core transformers using about the same percentage of the wave.

In an experiment, a Green & Bauer tube was lighted on two closed core transformers and about 80 milliamperes of current put through the tube on each for a few flashes, just long enough to make the milliampere readings. A short time later 90 milliamperes from an open-core machine spotted the target, which was untouched previous to that. While this observation is of no value in a comparative way, it nevertheless showed that the open-core transformer would produce great heat when the kilowatt energy was put in the tube. On the other hand, small amounts of current, 2 or 3 milliamperes, can be used in an X-ray tube continuously for fifteen minutes or more with closed-core transformers without causing any noticeable fall in vacuum. With closed-core transformers, about 7.5 kw. of energy can be put into suitable present day X-ray tubes for brief periods of time without injury to the tubes, and that is about the limit for open-core transformers. It is probable that there is no noticeable difference in the heat producing qualities of the two, due attention being paid to percentage of the wave collected, total energy in the tube expressed in kilowatt-seconds, and vacuum of the X-ray

tube. It is a fact that greater kilowatt conversion will occur in a low vacuum tube than in a high tube with the same transformer capacity.

As for quality of radiograms there is no doubt that excellent plates, rich in detail, can be made with open-core transformers, but that is equally true of the closed-core type. The making of a good roentgenogram depends upon several factors, the first of which in importance is probably the personal equation—experience of the operator and his familiarity with that particular machine. Inasmuch as interrupterless machines only are being compared, there is reason to believe that the X-ray tube is the factor next in importance. No matter what transformer is used there is no doubt whatever that the qualities of a roentgenographic plate depend largely upon the tube. Focus, rigidity of the anode, ability of the tube to maintain its vacuum during exposure, proper vacuum for the size of the individual and the part of the body to be penetrated, the method by which the tube has been pumped, and the nature of residual gases within the tube, all play important parts in determining the appearance of the plate after it has been developed. Probably the machine itself is a factor third in importance, but after that the photographic plate must also be reckoned with. Plates vary widely in sensitiveness, thickness, hardness, and keeping qualities of the emulsion. Moreover, much depends upon exact photographic methods in the dark room. The point is that superiority of one machine to another can not be shown by the making of a few sample roentgenograms. If quality of radiographic work is to be competent evidence, the plates should be of the same lot, made and finished by an experienced radiographer only after he has used the machines to be tested competitively long enough to be thoroughly familiar with their individual peculiarities. That is certainly so in respect to most of the machines as now controlled, some by resistance and some by reactance, and most of them without a voltmeter for estimating potential on tube terminals. If this much care is used in testing X-ray tube qualities yet remain variable, and this important factor is difficult to control unless the same tube is seasoned for both machines subjected to comparative tests.

The foregoing is not intended altogether as criticism of open-core transformers, but rather to show that claim to superiority based on the fact of an open core should not be considered seriously. It is manifestly true that good work can be turned out with machines having open-core transformers. Probably the point is of little importance one way or the other, but it figures largely in the advertising scheme, and such a single feature if dilated upon is calculated to trap an unsophisticated purchaser and deter him from giving all other features due consideration.

THE OPEN-CORE TRANSFORMER USED AS AN INDUCTION COIL.

Open-core transformers do possess the advantage of being available for use as induction coils if such use is desired. That, however, should not figure in the claim when they are to be used purely as step-up transformers for alternating current, because conditions in the primary circuit are very different with an interrupter in series.

At present, induction coils appear to give better satisfaction for fluoroscopic work than the unidirectional interrupted current output from the ordinary transformer. With an induction coil and, of course, with a transformer used for the time being as an induction coil, conditions are entirely different. Here we have a direct or rectified current interrupted in the primary circuit. In the secondary circuit we have an induced current in one direction when the circuit in the primary is made and in the opposite direction when the primary circuit is broken. There are no means at present for rectifying the secondary discharges, and as the potential in the secondary circuit is always higher in one direction than in the other, when any suitable interrupter is used, the higher voltage is used for the X-ray tube and current in the opposite direction, known as inverse current, is masked as much as possible. The open magnetic circuit helps and, sometimes, suitable condensers are also used. The vacuum of the X-ray tube must be high, however, to prevent inverse discharges from getting into the tube, but this is of comparatively little importance in fluoroscopic work. When an operator says he is using a low tube, operated by a coil, the vacuum is still considerably higher than would be suitable for the transformer type of machines. Utilizable output from the induction coil consists of impulses more or less oscillatory in form and the higher the voltage in the secondary circuit, that is, the greater the ratio of ampere turns and the more sudden and intense magnetization of the core, the more numerous will be the vibrations in each impulse able to break the resistance and enter the X-ray tube. With a given reading on the milliamperemeter there will be from 5 to 15 times as much value in milliampere-seconds with the tube energized by a coil as would be the case for the same period of time with the same milliampere reading were the tube lighted by a transformer. That is why correct exposure of radiographic plates is obtained with a coil in short periods of time with low milliampere reading. The induction coil output more nearly approximates a continuous current in time value than does that of the transformer with its regularly intermittent, 120 per second, evenly distributed impulses. Two milliamperes of current in the X-ray tube give better illumination of the fluoroscopic screen than can be secured with two milliamperes from a transformer. If the

current from the transformer is raised much the tube will be heated and the vacuum will change. Transformers can be used satisfactorily for fluoroscopic work in certain cases, even for the examination of deep parts, but they can not be used more or less continuously for two or three hours at a time, even with a water-cooled tube. Such demands can be met satisfactorily at present with coils.

For roentgenotherapy the interrupterless output has most desirable qualities in freedom from inverse discharge and constancy of current from minute to minute, but the tendency to cause increasing drop in tube vacuum, with consequent increase in the skin dose, makes the coil preferable to most roentgenologists for long or massive treatments. Each treatment must be controlled by a Sabouraud pastille or by some other form of self-registering radiometer. With a transformer, current strength and voltage being checked with a milliamperemeter and kilovoltmeter, it is necessary, practically, for all ordinary treatment work to determine only once the erythema dose for various combinations of voltage and milliamperage. It is then possible to repeat any particular dose as often as desired within sufficiently safe limits by giving the proper predetermined exposure, proper current and voltage being known. Care must be taken, however, to prevent a fall in vacuum during the exposure. In this way, use of pastilles can be obviated in routine therapeutic work. With a coil, one has no other way of accurately estimating full skin dosage than by using a pastille for each exposure. If one is willing to use several tubes, massive treatments can be given by transformers with very accurate dosage, provided a kilovoltmeter is at hand to register voltage across tube terminals.

TRANSFORMER CAPACITY.

X-ray tubes with tungsten targets are now so constructed as to stand about 7.5 kw., conversion energy, for short periods of time, one second or several flashes. Electrical apparatus, of course, can be designed for a much greater output of energy. Improvements have been made in X-ray tubes from year to year, and doubtless they will continue to be made. For this reason it does not seem worth while to consider seriously the purchase of an interrupterless transformer having conversion capacity of less than 8 kw. on either direct or alternating current. Even that is buying only for the tubes of to-day. With future and more durable tubes in mind it is possible that 12 kw. or even 15 kw. machines should be required. Of course, for average deep work, less than 6 kw. is required unless one prefers to make short or instantaneous exposures for all work, a plan that is not followed by many expert radiographers, because the best plates are not gotten with satisfactory regularity in that way.

There are times, however, when instantaneous exposures are required, and apparatus should be selected with maximum utilizable capacity in mind.

Interrupterless transformers on the market differ widely in kilowatt capacity claimed, and in the methods by which the rating has been assigned. Conversion capacity is the only satisfactory test. Details, such as sized wire in the primary windings, insulation, choke for maximum load, and size of rotary transformer or generator, we are not directly concerned with. Naturally, the manufacturer should make proper provision for the protection of his apparatus. The test should be to find out whether the machine can deliver the required eight or more kilowatts under best working condition. If the switchboard is provided with a kilovoltmeter which will indicate potential on tube terminals, and a milliamperemeter, X-ray tubes can be used to test energy conversion up to tube capacity. Beyond that the machine must be tested across an air gap with an ammeter in the primary circuit.

With an X-ray tube in series, kilowatt energy in the tube is very simply calculated by multiplying the number of milliamperes by the number of volts across tube terminals or banked on the machine. For example, the potential across terminals is 80,000 volts, and the full output of the machine allows a current flow of 90 milliamperes. Obviously, the total conversion capacity for the machine with a tube of that resistance in series is 7.2 kw. It should be mentioned, however, that conversion capacity of the machine will be greater if a tube of lower vacuum is used. With the example above in mind, if maximum capacity remained the same for tubes of different resistances, we should expect this machine to put not more than 120 milliamperes through a tube maintaining 60,000 volts on its terminals. As a matter of fact, the milliampere reading is quite likely to be much higher than 120, showing greater output when resistance in the outer circuit is decreased.

When the machine is tested across an air gap, conclusions are less satisfactory and current values are less significant. If a flaming spark is permitted, the ampere reading in the primary circuit is high because there is practically a short circuit, and voltage in the secondary circuit drops way down at the same time. Under these conditions the ratio of transformation does not give a factor by which conversion capacity can be worked out from watts in the primary circuit. Short-circuiting across an air gap is a test of the primary insulation. The length of air gap which can be broken is a rough test of voltage in the secondary circuit. For the higher pressures, every inch of parallel spark is equivalent to about 10,000 volts. If the machine can throw a spark 10 inches at every throw of the switch, 100,000 volts can be assumed. This calculation is a little more accu-

rate if the sparking is between balls 2 cm. in diameter instead of between points. Heavy current in the primary with an unbroken air gap in the secondary circuit, a long gap, is a test of the insulation in the secondary winding and circuits. Terminals of the machine are seldom placed farther apart than 10 or 12 inches, and this gap can surely be broken by a current of 125,000 volts. For satisfactory tests, it would be convenient to have fixed resistance of 700,000 ohms or more, so constructed as to bank 80,000 volts on the machine.

Conclusions in regard to power of a machine under examination must depend, ordinarily, to some extent at least, upon the word of the manufacturer as to ampere turns and capacity of the primary winding. Confirmatory evidence is gotten by making tests with X-ray tubes, and also by observing the relation between rheostat or reactance points and short circuits across the maximum air gap permitted.

It must be admitted that tests with X-ray tubes are only approximate, for the current in the tube circuit is interrupted 120 times per second, and every impulse rises from an undetermined potential to maximum and falls again. The voltmeter does not register fluctuation in voltage, and since the curve can not be plotted accurately the energy put into a tube can not be calculated exactly. Such calculation is simple in the case of the Cabot machine inasmuch as the current in the secondary circuit is continuous and there is but little fluctuation in voltage. However, estimations made in this way for the ordinary interrupterless machine are sufficiently close for all practical purposes.

VOLTAGE AND INDUCTANCE.

Maximum voltage claimed varied from 100,000 to 180,000 for the machines examined.

Potential at the terminals of the secondary coil depends entirely upon the number of ampere turns on a step-up transformer, no matter whether the magnetic circuit is closed or open. Other considerations, pertaining to induction coils, have no force here. Secondary voltage will be in accordance with the ratio of transformation, provided there is not enough resistance in the primary circuit to check the full effect. A little deduction must be made for copper and core losses; a very little in the case of the closed core transformer. Calculations based upon the windings of a transformer are likely to be pretty accurate.

The value of very high voltages for producing X-rays is questionable. With either continuous or interrupted current, voltages higher than 80,000 across tube terminals do not make for good roentgenographic plates. X-ray penetration depends practically upon voltage alone. This is shown conclusively by the action of tubes when lighted

by continuous currents. With the interrupted output from the ordinary transformer, tubes seem to behave differently at first sight. The difference, however, is only apparent. To illustrate this point, consider a tube with its vacuum adjusted to bank 70,000 volts on the machine while the tube is passing 20 milliamperes of current. Now, this tube, under such conditions, emits rays of definite penetration, and it will make a shoulder plate, say, in a certain number of seconds, representing the minimum time for correct exposure. If it is desired to make this exposure correctly in just half the time, 40 milliamperes must be used. Now, the only way we can increase current in the tube is by cutting out resistance in the primary and, if we do that, not only will the current in the tube increase, but a higher voltage will be registered across tube terminals, resulting in greater penetration as well as faster work. Higher voltage is registered because closer approximation to full value of the transformation ratio follows the cutting out of resistance in the primary circuit. If, on the other hand, the tube's vacuum is lowered so that it will pass 40 milliamperes with 70,000 volts across terminals, then the exposure can be made in half the time and penetration will remain the same. Increasing current in the tube makes for increased quantity of X-rays, a higher value when expressed in milliampere seconds. Increasing voltage surely results in greater penetration.

Tubes banking 60,000 or 65,000, up to 70,000 volts are best for roentgenograms of the hand and forearm. 60,000 volts will give much contrast in the soft parts and white bone shadows. 70,000 to 75,000 volts indicate suitable penetration for the shoulder. For the kidney the reading should be between 70,000 and 75,000 volts, according to the subject. Very heavy subjects may require 80,000 volts. Chest plates can be made with 70,000 volts or less with some subjects. 80,000 volts are required for bismuth plates of the stomach, hip plates, and frontal sinuses. Possibly 85,000 volts will be required for exceptional subjects. On the other hand, 75,000 volts will give best plates of bismuth filled intestines in thin subjects.

From experiments made during the past six months at the Chelsea Naval Hospital with a closed-core transformer the conclusions are as follows:

60,000 volts across terminals of the average reasonably good tube give a penetration on the Benoist scale between 5 and 6.

70,000 volts, 6 to 7 B.

80,000 volts, 7 to 8 B.

90,000 volts, 9 to 10 B.

Plates, even of deep parts, have been flat and lacking in contrast when penetration of 9 B. has been used. Exposure time is less with high penetration because there is a higher percentage of actinic power

available at the surface of the plate. That is to say, a smaller percentage of the highly penetrating ray is absorbed in passing through the tissues. However, with high penetration the bones are penetrated almost as readily as soft parts, and consequently very little contrast is recorded on the plate. A ray of such penetration that 100 per cent of its actinic value is absorbed in its passage through the tissues, of course, will not affect the photographic plate at all. The object should be to use rays of just such penetration that those passing through the most dense portions of the exposed tissues will affect the plate very weakly, while the softer parts, by absorbing less of the ray, will permit greater actinic effect, resulting in a roentgenogram of maximum contrast. Plates stand considerable overexposure well if proper penetration is used. For example, with penetration of 6 to 7 B., 65,000 volts, and 30 milliamperes, a good plate can be made of a hand if the exposure time is 2 seconds or 10 seconds, and the plate can be saved if it is given 15 seconds. With too high penetration, the danger of overexposing is great. There is little latitude between under and over exposure; the plates tend to flash up in the developer and quickly fade into a uniform gray density. The heavier the subject and the thicker the part to be radiographed, the less actual difference in density is there between the plane containing bone and the planes containing only soft parts, but of the same thickness, as in the thigh, for instance. Here it is even more important not to use a ray of too great penetration than in the case of a smaller part. With a hand, for example, the actual contrast in density is so great that an acceptable plate can be made with rays of the highest penetration. These conditions in the hand are responsible for the claim, sometimes made, that the same results can be obtained with a high tube as with a low tube if the exposure is short. Of course, the best plate can be made with rays of suitable penetration, 6 B. to 7 B. for the hand.

At the Massachusetts General Hospital, careful experimental work during the past two years with the Cabot high potential D. C. converter has resulted in some interesting conclusions which are valuable for ordinary interrupterless machines as well, if certain allowances are made. Numerous quantitative measurements were made by Mr. Cabot and Dr. Walter J. Dodd. In Mr. Cabot's words, "Results of these measurements which may be of interest are as follows:

"The truth of Sir J. J. Thompson's law governing the dissipation of X-light as it penetrates an absorbing medium was checked within the limits of observation. This law may be stated as follows: Each unit of thickness penetrated absorbs a fixed percentage of the energy transmitted to it, and this percentage is dependent

upon the penetration of the ray and the nature of the absorbing medium.

"II. The thickness of dissipating medium penetrated which absorbed a fixed percentage of energy of X-light, was found to be directly proportional to the voltage maintained on the tube terminals.

"III. It was discovered that using tungsten or platinum targets the voltage maintained on the tube terminals might be read from the Benoist gauge. Thus, 3 Benoist was produced by 30,000 volts; 5 Benoist was 50,000, etc.

"IV. The absorption of energy at the various degrees of penetration in common use as it penetrated tissue was measured and a set of curves prepared showing graphically the distribution of energy absorption. * * * The data from which these curves were obtained were arrived at by watching areas on a photographic plate which were equally darkened by exposure. This method is not susceptible of great accuracy and there is a possible error of about 20 per cent."

Briefly stated, some of the conclusions arrived at were as follows: Voltage across tube terminals controls penetration. By means of the quality lever (variable inductance switch) and quantity lever (resistance) the current and voltage in the tube circuit can be controlled so that a single X-ray tube can be made to emit rays of either low or high penetration at the will of the operator, and, with either, the current may be much or little. That is to say, a tube of moderate vacuum may be used for mixed work; first being used with low penetrating rays for handwork, then with a penetration of 9 or 10 on the Benoist scale for fluoroscopy, or with heavy current at a penetration of 7 Benoist for rapid exposure of plates through deep tissues. The one tube can be used for first one and then another purpose by simply changing the voltage in the tube circuit and putting the desired current through the tube. Of course, it is desirable to use good tubes as it is with any machine. but it is probable that more can be done with a cranky tube under such continuous current than can be done with it on the ordinary machine. Certainly the machine seemed to do all that Mr. Cabot claimed for it in the one test tried by the writer, using a Campbell tube of rather high vacuum previously tried out on one of the transformer type. This tube backed 85,000 to 90.000 volts on the transformer. On the Cabot converter it was lighted evenly by voltages ranging from 42,000 all the way up to 90,000 volts. With the converter, a tube of high vacuum can be lighted by lower voltage than with the ordinary transformer. With the continuous current, once the tube is lighted, a path of conductivity can be maintained through the tube by lower

voltage than the lighting voltage. Such conditions can be approximated with interrupted transformer currents by closing the parallel spark gap to a point where a continuous stream of sparks breaks across. Then, a high vacuum tube can be lighted with lower voltage than the state of its vacuum requires under ordinary conditions, due to the condenser effect of sparking between terminals of the machine. Slight accumulation on terminals makes for elasticity which helps to maintain a conducting path through the tube. Such a maneuver does not give a very flexible control of the tube, the current is not steady, and only a part of the energy output of the machine goes into the tube.

It was a fortunate coincidence, and one that makes calculation unnecessary, that it should be discovered that the penetrating quality of rays emitted, no matter what the vacuum of the tube, within reasonable limits, keeps step with the voltage maintained on tube terminals; 30, 40, 50, 60, 70, 80, 90, and 100 kilovolts giving respectively penetration of 3, 4, 5, 6, 7, 8, 9, and 10 on the Benoist scale.

A limited amount of work done at the Naval Hospital, Chelsea, with the Campbell transformer has given practically the same results, except that the lower voltages have given penetration values a little less; 70,000 volts giving between 6 and 7 on the Benoist scale rather than a full 7. However, it is not as easy to work with pulsating currents, and experiments were hampered by the use of a kilovoltmeter, which was not sufficiently a dead-beat instrument. Doubtless, with more careful work, penetration factors would be found to agree very closely with those obtained for the Cabot machine. Theoretically, only a part of the difference between lighting voltage and running voltage should represent the difference between the continuous-current converter and the ordinary pulsating-current closed-core transformer.

On account of the close agreement of penetration factors for both types of machines, Cabot's conclusions in regard to suitable penetration for various kinds of radiographic work are of interest. In his words:

30–35 kv.—Suitable for hand and chest work on thin subjects where the greatest contrast is desired in tissue details.

35–40 kv.—Suitable for general work where distance of tissue to be penetrated is small and great contrast is desired.

40–45 kv.—Suitable for bone work where thickness of tissue is under 2 inches. Best for chest work on 100-pound subjects and for general tissue detail using intensifying screen.

45–50 kv.—Suitable for bone work on the extremities and chest work on 150-pound subjects.

50–60 kv.—Best for kidney work on light subjects. May be used on light subjects for bismuth work. Good for general bone work of the extremities.

60–70 kv.—Same as above with increasingly heavier subjects.

70–80 kv.—Only suitable for hip, frontal sinus, and bismuth work, unless contrast between details is not desired, as plates show considerable loss of contrast.

When we come to the consideration of exposure factors there is considerable difference between the continuous current converter and the pulsating current interrupterless transformer. Quantity of X-rays emitted at any given time, or the amount of X-light available for chemical effect on the photographic plate, irrespective of penetration of the rays, is governed entirely by the amount of current entering the tube. In other words, the greater the current the more numerous will be the corpuscles propelled from the cathode and impacting on the target in any given time, irrespective of electron velocity. Now, in the case of continuous current, with 20 milliamperes for an exposure of one second, it can be stated that the quantity value is 20 milliampere-seconds, but the value can not be so simply calculated for pulsating currents. In the first place, we do not know exactly during what fraction of a second current is actually passing and current values are not constant during the flow. Current curves do not follow voltage curves exactly, and, because of fluctuating voltage, rays are emitted from maximum penetration down. Nevertheless, current or quantity factors are constant for any given machine, if due allowance is made for the individual freaks of various X-ray tubes, depending upon the nature of the residual gases in the tube, whether left in by the pumps or later freed from the metals. It must be conceded that tube peculiarities make less difference in the case of the continuous current machine, but even here it must be a subject of considerable importance.

The point is, with familiar and reasonably good tubes, if the voltage on tube terminals can be known, thus controlling penetration of the ray, consistent good plate work can be done from day to day with the ordinary interrupterless transformer, for current values will be the same from day to day, and if 40 milliamperes, with a given voltage, give a correct exposure time of 5 seconds one day they will continue to do it with the same tube until the tube reaches its cranky stage, and a large number of plates can be made with a tube before it has outlived its usefulness. Moreover, average or reasonably good tubes do not vary as much as might be thought in the matter of correct exposure times under the same energy factors. With the ordinary interrupterless machine a given X-ray tube can not be used for any great range in penetration. Vacuum of the tube

is the principal factor in determining penetration. If a high tube is to be used where rays of low penetration are desired, the vacuum must be lowered, except that within certain limits, voltage across tube terminals will be less when the lowest possible inductance necessary to light the tube evenly is used and if less current is used. For instance, a tube that banks 75,000 volts on the meter with 70 milliamperes, may only bank 70,000 or 65,000 volts with 20 milliamperes. In the latter case penetration is accordingly less but exposure time is correspondingly increased. Often that does not matter, as in work on the extremities, where 20 milliamperes may give reasonably short correct exposure time, and if it is desired to use the same tube for deep work shortly afterwards the vacuum had best not be reduced. Continuous current is much more satisfactory and flexible. Reduced to figures, probably about 75 per cent of the rays emitted from a tube activated by the ordinary interrupterless transformer are of maximum penetration for the particular voltage maintained on tube terminals during a given exposure. Current resulting in the discharge of corpuscles having sufficient velocity to furnish rays included in this 75 per cent of total rays emitted, probably flows for 30 to 33 per cent of the time during a given exposure.

The importance of having a voltmeter on the switchboard which will indicate at all times the voltage maintained on tube terminals should be emphasized. The aid which such an instrument gives can best be appreciated by using one, although the foregoing discussion will serve to point out its uses. Among the machines exhibited during the convention the only two so equipped were the Campbell transformer and the Cabot converter. The expert roentgenographer who uses a transformer, by becoming thoroughly familiar with the caprices of his apparatus, gets to the point where by instinct he is at all times pretty much aware of the penetration of the rays he is working with; but, even in his state, how much better it would be for him to know, not instinctively altogether, but as a matter of fact, just what his tube is capable of doing under absolute conditions. It is a safe prediction that all manufacturers will have to put such instruments on their control panels sooner or later. The practical arrangement is to put a voltmeter in shunt with a selected number of turns in the secondary winding, few in number to keep the actual voltage reasonably low in the switchboard circuit. The voltmeter must be across turns which are in a grounded or neutral part of the secondary. Pressure at the switchboard must not be higher than 500 volts, and it should not be higher than 220 volts, although, by proper calibration, the meter indicates kilovolts. This voltmeter must be quick acting, and it ought to be as nearly as possible a dead-beat instrument.

Having considered suitable voltages at tube terminals necessary to meet properly various roentgenographic demands, we are now in a position to take up the question of maximum voltage desirable in the output from the transformer. Suppose the voltage of a machine across an unbroken air gap is 120,000 volts with the resistance lever advanced but to the point where, ordinarily, only the lightest kind of roentgenographic work is done. Now, assuming that 40 per cent of each alternating wave is collected by the rectifying device, and making ample allowance for drop in potential during commutation, while current is flowing in the tube circuit there is fluctuation between not less than 93,000 and 116,000 volts. If only 30 per cent of the wave is commutated, voltage in the tube circuit never fluctuates lower than 98,000 volts. Therefore, it would seem that a transformer wound for a secondary potential of 120,000 volts is capable of meeting all demands of mixed roentgenographic work, a closed magnetic circuit being assumed. Certainly, a machine like the Waite & Bartlett, designed to deliver 148,000 volts, can meet all actual requirements and have considerable margin to spare. Maximum output of 100,000 volts gives no margin above ordinary demands, and there seems to be no good excuse for winding a transformer to this end except in the case of a continuous-current machine with little fluctuation in voltage. In the case of an open-core transformer there is some reason for higher voltage, particularly in the case of the Scheidel-Western machine, which has a generator delivering alternating current of about 220 volts, because when the transformer is used as an induction coil on the 220-volt direct current, obviously, a higher transformation ratio is required to maintain the high potential necessary for good coil work.

VARIABLE INDUCTANCE.

Any interrupterless transformer equipped with a variable inductance switch can be made to do all its work with the switch set at some particular notch, and in any case three-fourths of the work will be done on that notch. The Cabot machine is not included in these remarks. Manufacturers who provide only rheostat control claim that their method combines flexibility with simplicity, and that any strength of current from minmum to maximum can be sent through an X-ray tube, and that tubes of either high or low vacuum can be used. Such claim has a considerable percentage of truth in it. The designer takes care to make his ratio suitable for average demands, realizing that highest current values are absolutely necessary only with highest voltage. It is also true that tubes with considerable range in vacuum can be used, it being remembered that the difference in vacuum is not great for rays of moderate and high utilizable pene-

tration. However, without variable inductance, tube vacuum must be adjusted more accurately and more frequently if best results are to be obtained. If current and voltage can not be controlled independently, then tube resistance must be adjusted to suit the machine. In the long run, that is hard on tubes unless a number of them are kept on hand, each being selected and seasoned for its own particular kind of work. On the other hand, variable inductance affords to some degree an approach to the flexibility of the Cabot D. C. converter. While a single tube can not be made to perform as variously with pulsating currents, yet a high-vacuum tube can be made to emit rays of relatively low penetration by using a lower ratio of transformation. At the same time, higher current values can be obtained by manipulating the rheostat independently. Then immediately afterwards the same tube can be used for deeper work without its vacuum having been changed.

As for simplicity of the single control, any man who can be trusted to subject patients to the influence of high-powered apparatus must know enough to take advantage of a separate switch for controlling voltage.

A variable inductance switch should be on every control panel. At times it can be used to good advantage, and the fact that one can manage to do without it is no excuse for its absence. In competition, its absence is one point against one or two otherwise excellent transformers.

INSULATION.

Probably hydrocarbon oil insulation is best. Both the Westinghouse and the General Electric Co. use oil insulation for all high-tension currents in commercial circuits, and they generally know what they are doing. The objection sometimes raised that oil is likely to leak out of the tank or to be accidentally spilled is not a very serious one. No difficulty was experienced in two years with the outfit, the original "Solace interrupterless" supplied by the Waite & Bartlett Co. for use on board the U. S. S. *Solace*, and during that time she was at sea in several heavy storms.

However, the chief practical consideration is whether the insulation will stand, and if the solid or semisolid mixtures of resin, beeswax, and vaseline will maintain dielectric strength indefinitely no fault can be found with such insulation of the secondary coil. Mica is generally used between layers in the secondary winding.

Insulating features outside the transformer case itself are open to observation. Adequate separation by air is the most important thing here, but usually air insulation is strengthened by the use of hard rubber conduits, plates, etc. An eye should be had for the number of curves and the sharpness of turns in hard rubber fixtures, for this

substance can not be heated and bent very much without losing some of its dielectric strength. Every manufacturer should stand squarely behind his insulation with a matter-of-fact guaranty. The Victor Co. is said to guarantee its apparatus against breakdown for 20 years. Most manufacturers, indeed, are only too willing to make good any defective insulation, but the point is, it is often very annoying to have little things give out, as, for instance, the insulating tubes to or from the rectifying switch. Breaks or short circuits in the transformer itself must be of rare occurrence with any of the apparatus described. Such accidents, if they do happen, must be considered as due to defective workmanship, and quite justly the manufacturer should make good the damage at his own expense. Such contingencies should always be covered by guaranty.

COMMUTATION OR RECTIFICATION.

This function can be accomplished in several different ways, either by using a single large, two, or three revolving disks, as well as by four revolving cross arms on a single shaft. The original General Electric Co.'s patent was obtained on four revolving cross arms, and this method is still in use in the Snook and Solace interrupterless machines.

No matter what the arrangement, essential features are the same. In brief, there must be four fixed or stationary points and at least two metal paths revolving in step with the rotary generator or in step with a synchronous motor in case the alternating current is taken from the service line. Two of the fixed points are connected with the terminals of the secondary coil and the other two are connected with binding posts on the outside of the cabinet which are the positive and negative poles of the machine. The revolving switches carry flying bridges, as it were, for connecting first one set of the fixed terminals and then the other. The revolving arrangement, which is coupled to the motor shaft by adjustable bearings, is then set in proper position to insure a continuous metal path from the terminal of the transformer which happen to be positive for that particular alternation to the positive binding post on the outside of the machine. In the case of a single large disk the metal rim or path is between points, including one-fourth the circumference of the disk. The four stationary fixtures are located at points opposite the rim and equidistant from one another. By one-fourth of a revolution the conducting path is reversed, the opposite terminal of the secondary winding being connected by the metal bridge leading to the anode of the machine. That is, two cycles are commutated by every revolution of the disk to a unidirectional current. With the rotary converter turning at 1,800 revolutions per minute 3,600 cycles or

7,200 alternations a minute are transmitted to the anode; or, in other words, 120 pulsations per second, which is the same thing, of course, as a 60-cycle single-prase line service where the disk is revolved by a motor in synchronism.

The four stationary fixtures may be equipped with brushes to make actual contact with the metal on the disk as it passes, or there may be a small air gap. The fixed pieces may be points, combs, or plain metal shoes. The lengths of these shoes or arcs determine the percentage of each current wave commutated. If an air gap is left there must be a slight drop in voltage across the commutator, but experiments with and without contact brushes have failed to show any appreciable difference with X-ray tubes. With brushes, however, the machine runs more quietly, since sparking at the commutator and motor sounds are the only sources of noise while the machine is in operation.

The Scheidel-Western machine is equipped with combs, and oscillograph tracings are shown to demonstrate a modification of the sine wave, a series of ripples claimed to give better effect on the X-ray tube. Voltage and current effects have already been discussed; but, assuming the ripple to be there—which seems doubtful, inasmuch as the comb is all one piece of metal, and air gaps between teeth are not very different from the gap between the revolving contact and the shoe as a whole, and in any case since these gaps interpose but little resistance or condenser effect in virtue of the high tension maintained across them—theoretically the effect on an X-ray tube in operation would be nil. Independent experiments with similar devices have not shown any effect on tubes that could be recognized.

When cross arms are used instead of metal-rimmed disks for revolving metal bridges in commutating, it is necessary to use four cross arms and eight stationary fixtures or shoes to match their ends. The shoes must be bonded in pairs, since the transformer leads both go to one side of the rectifying switch in order to economize space and at the same time remain at a safe distance from other shoes or leads. On account of the necessary bonding of shoes, high-voltage points are separated on that side only by the space between the two inner shoes. It is necessary to place insulators of hard rubber or glass between pairs of shoes on both sides. Such arrangement will stand the pressure, particularly if glass is used, but it is a weak spot and one should be provided always with extra insulating plates in preparation for emergencies. French plate glass is suitable. On a pinch a piece of pure soft rubber at least an inch in thickness will do. Fiber will not serve at all. Mica will answer after a fashion if a single thick piece with smooth surfaces can be obtained. If hard rubber is used it is necessary to make sure that it

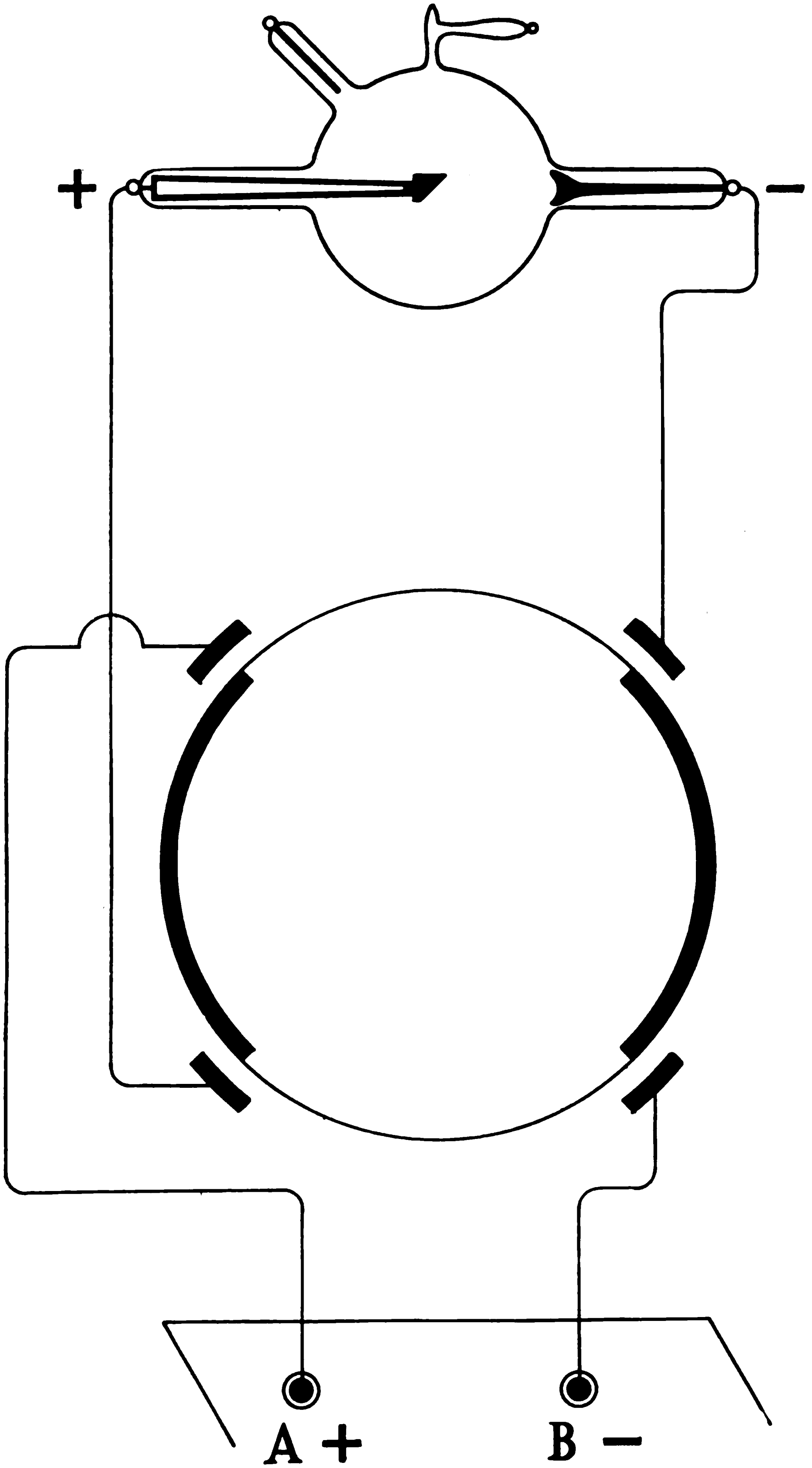


FIG. 6.—RECTIFICATION BY MEANS OF A SINGLE REVOLVING DISK.

First position of the disk, showing the conducting paths during that alternation in which terminal "A" of the transformer happens to be positive.

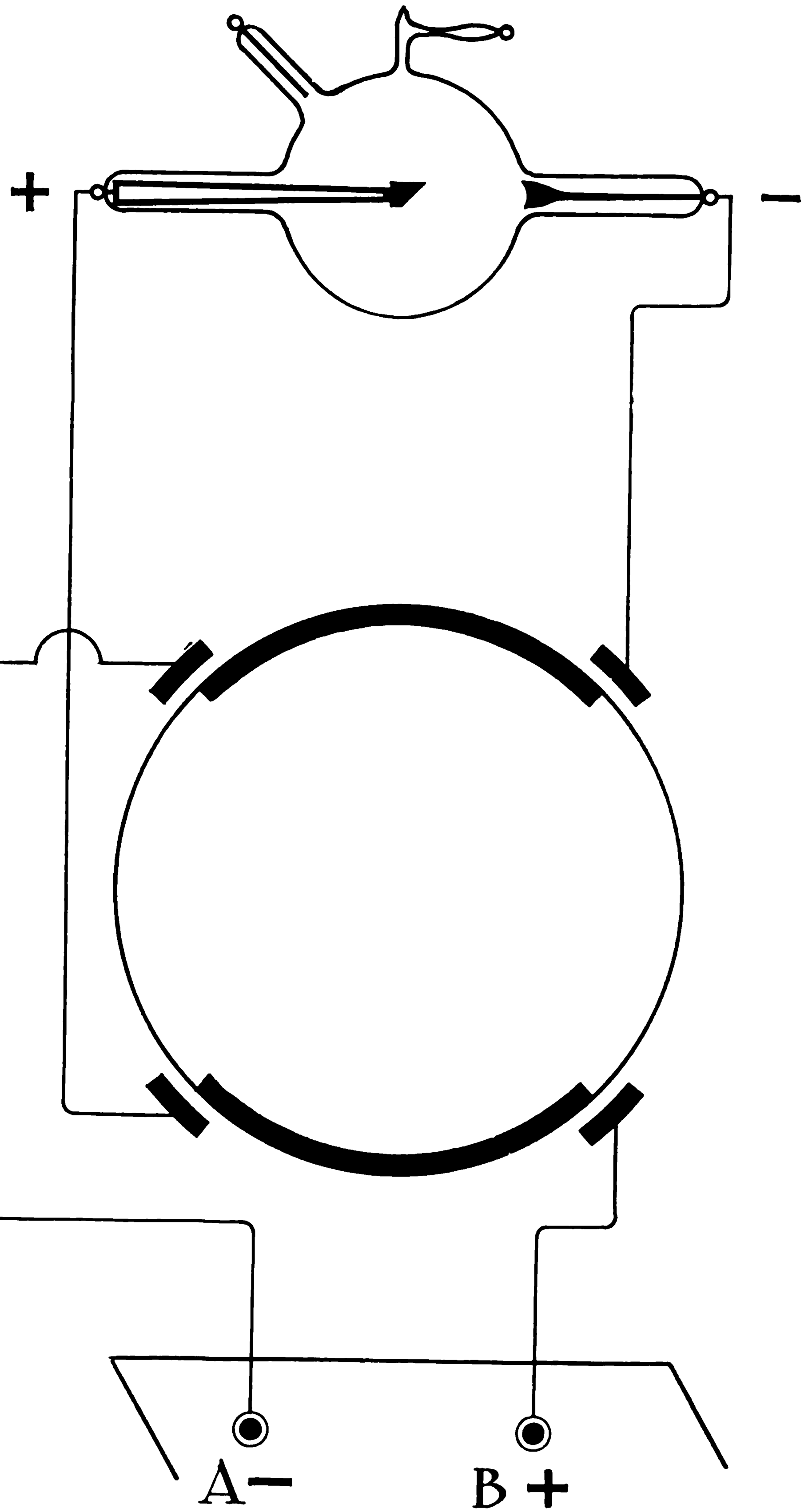


FIG. 7.—RECTIFICATION BY MEANS OF A SINGLE REVOLVING DISK.

Second position of the disk, showing the conducting paths during the opposite alternation when terminal "B" of the transformer is positive.

is free from joints and surface defects. It must be bent very carefully, with as little heat as possible. and well protected with vaseline. At best the cross-arm arrangement for commutation is bulky and unnecessarily elaborated, but smaller percentages of the wave can be collected than by a single disk. However, with the average transformer maximum voltage is so much higher than tube requirements under working conditions that 35 to 45 per cent of the wave seems best suited to practical needs, so the point has no value.

The main disadvantage of the single large disk is danger of its flying apart at high speed. The danger increases geometrically with the diameter. Unless the diameter is at least 24 inches intervening segments of disk substance have not sufficient dielectric strength to resist indefinitely the high pressure between metal points. A weak spot anywhere near the end of a piece of metal at the periphery, once started, will lead rapidly to a carbonized channel across the disk, with consequent short-circuiting. Pressed mica shellacked seems to be the most suitable substance for construction of the disk, but its tensile strength is not great. Hard rubber will not keep its shape. Hardwood has strength, but its tendency to warp is a serious disadvantage. The disk must be perfectly balanced in a lathe and perfect alignment must be preserved. It is different in the case of a long shaft with cross pieces, which can be balanced in two bearings and coupled to the motor shaft by a universal joint. On the whole, mica is the best material for building the disk. The danger of carbonizing in the neighborhood of metal pieces can be much lessened by cutting the mica away from the peripheral metal pieces so that instead of a circular disk there is left a flat panel, both rounded ends of which are arcs of the original circle.

With two disks on the motor shaft, diameters can be less, for while high-tension points are still across sectors, each representing one-fourth the area of the disk, yet advantage in insulating is secured by the fact that the two disks are in parallel, in a sense, because similar areas on both disks must be subjected to stress at all times, high pressures being equally divided. If two disks are used two bearings are required, and doubtless manufacturers find the additional expense an objection, inasmuch as little or no electrical superiority is obtained. From a mechanical standpoint the double arrangement is much more secure, for, in order to maintain the same efficiency in insulating properties, a single disk must approach the limit of safety in size. With three revolving disks, as used in the Kny-Scheerer machine, high voltage points can be kept apart by distances equal to the whole diameter of each disk. Of course diameters can be even less in this case, but the required length of shaft necessitates a long cabinet, and success in the use of two or even a single disk demonstrates the bulky cabinet to be unneces-

sary. Disks can be made with perfectly safe area, both electrically and mechanically, for the double arrangement. Indeed, the writer has yet to hear of the disruption under service conditions of a disk designed to be used singly. Instead of using a single circular disk dielectric strength can be augmented by making it a panel with two rounded ends framed in metal, and at the same time it can be kept within safe structural limits. Such expediency was suggested during construction of the apparatus specially modified for use at the Naval Hospital, Chelsea, and it was later adopted by the company as their regular type. This arrangement is a little more noisy than a circle because it has more fan action, but the rapid removal of ionized gases thereby accomplished is another advantage to offset the slight whir.

No matter what the arrangement, single disk, double, or cross arms, the commutator is set as a whole on the motor shaft by means of an adjustable bearing, which should be provided with heavy locking bolts, nuts, or other reliable devices which will prevent any slipping once it has been set in proper relation to the motor. With a long shaft a universal joint of some degree is necessary, as in the case of an automobile driving shaft. A simple method of adjusting the commutator consists in trying it with slight changes in position until, with the same resistance and inductance, the same spark is thrown from both anode and cathode, alternately reversing the terminals at the parallel spark gap by means of the pole-changing switch in the primary circuit. The spark gap should be opened to the point where it is not broken and then gradually closed until a spark is thrown across with one throw or the other of the polarity switch.

GENERATORS, ROTARY CONVERTERS, AND SYNCHRONOUS MOTORS.

An interrupterless transformer designed for operation on a direct current service line is equipped either with an inverted rotary converter or a double-wound motor generator. The latter has the advantage of delivering current on the A.C. side under nearly or quite as high voltage as that of the D.C. service supplying the motive power. With the ordinary rotary converter, with single winding. voltage on the A.C. side is always less, averaging 68 or 70 per cent of the pressure on the D.C. terminals. Under these circumstances transformer winding ratios must be greater to make up the difference. That means more copper and some additional expense for workmanship on the extra turns. The matter is of more importance in relation to the open-core transformer. Here, core losses can only be balanced by cutting down copper losses, and this means more

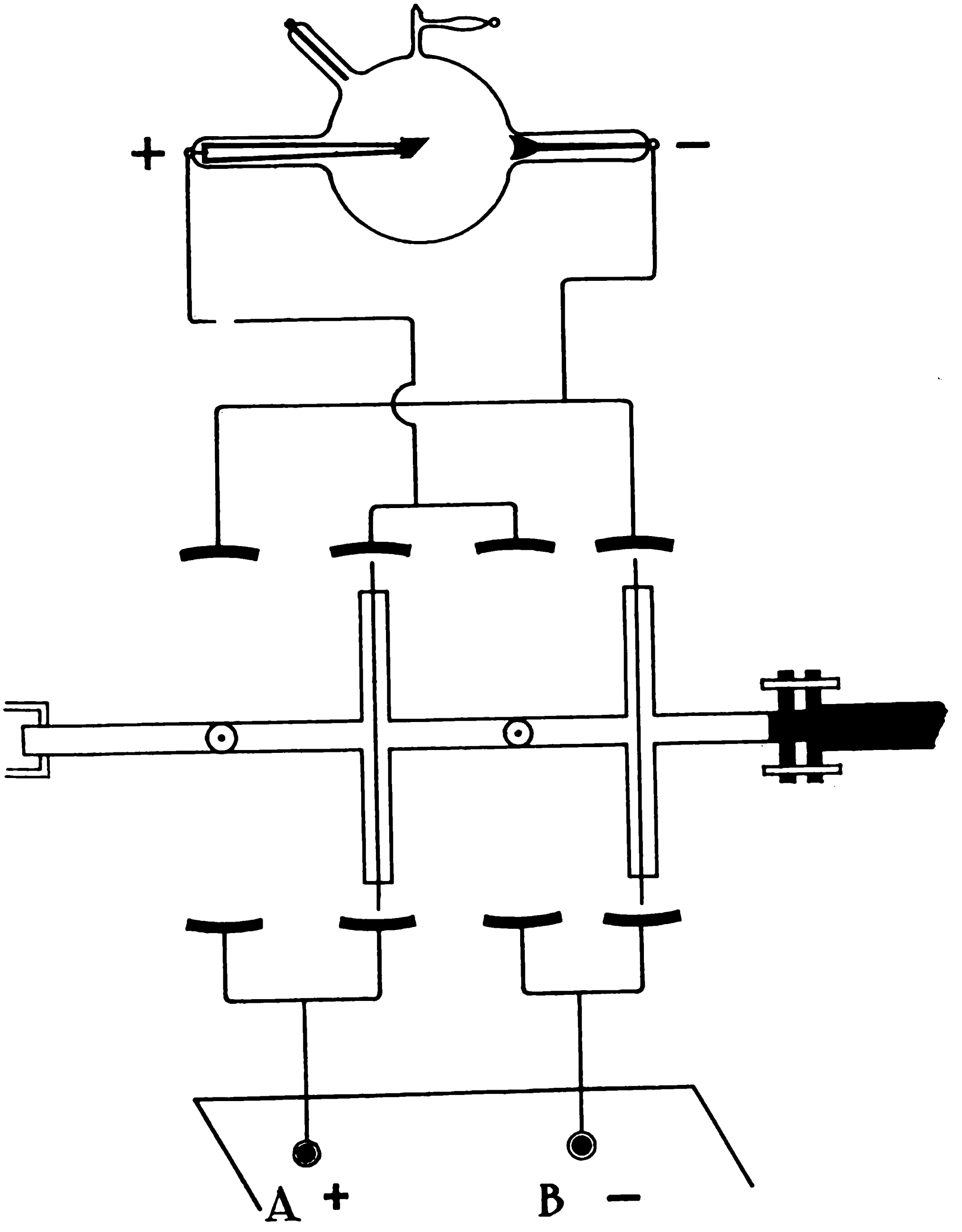


FIG. 8.—RECTIFICATION BY MEANS OF A REVOLVING SHAFT WITH FOUR CROSS ARMS AND EIGHT FIXED SHOES.

First position of the commutator, showing conducting paths during that alterration of the current in which terminal "A" of the transformer happens to be positive.

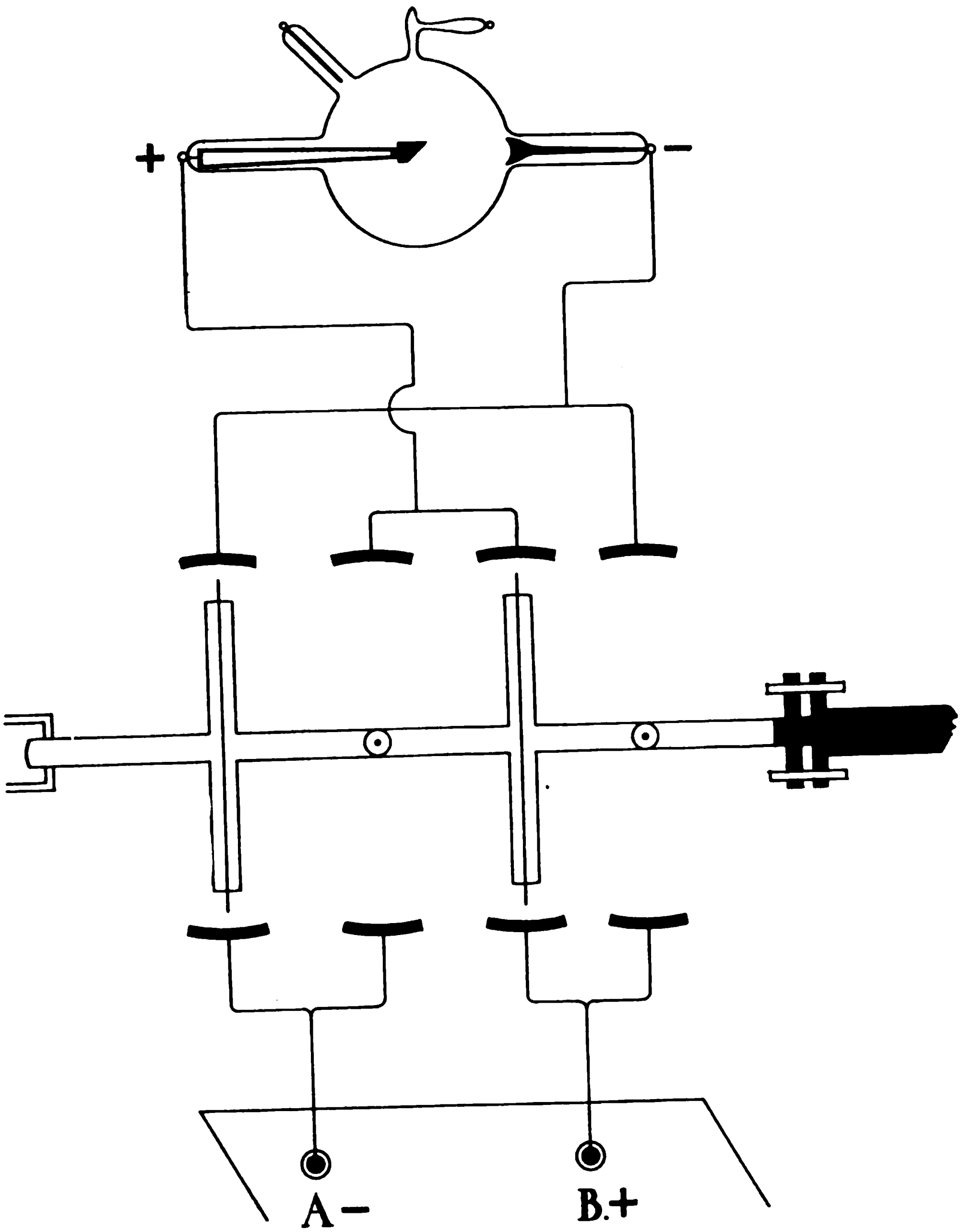


FIG. 9.—RECTIFICATION BY MEANS OF REVOLVING SHAFT WITH FOUR CROSS ARMS AND EIGHT FIXED SHOES.

Second position of the commutator, showing conducting paths during the opposite alternation when terminal " B " of the transformer is positive.

turns and more copper in the primary winding to begin with than is necessary with a closed magnetic circuit. Therefore, in the case of an open-core transformer it is rather more important to maintain as high voltage as possible on the primary winding to prevent the necessity for an unduly large number of actual turns in the secondary winding. It is sometimes claimed that the generator with double winding gives an alternate current with better characteristics. There is no reason why the ordinary inverted rotary converter, properly wound for the load to be put on it, should not give a true single-phase alternating current, and that is all that is demanded of a commercial transformer on the street. The Scheidel-Western Co. claim that the alternating current wave developed by their generator excites their core with the characteristics of a coil using a mercury interrupter without a condenser. Alternate currents regularly periodic have nothing in common with the abrupt impulses caused by any form of interrupter.

Rotary converters or generators, driven by direct current and yielding alternating current across their collecting rings, stand heavy overloads, upward of 100 per cent. without evidence of strain if properly constructed. The Victor rotary is rated 3.5 horsepower, and at the same time conversion capacity of their transformer up to 10 kilowatts is claimed. That is about 13.4 horsepower, and it would amount to about 380 per cent overload. Their agents speak of the ability of the converter to pull current through the motor from the line.

To stand overloading well, rotary converters must be compound wound. In the case of a shunt generator, its magnetism is abruptly reduced with sudden overloads and constant voltage can not be maintained. The drop in voltage is due partly to decrease in resistance with reduction in the shunt circuit and partly to magnetic losses and armature reactions. The machine tends to slow down and groan under heavy overloads. For constant voltage with widely varying current demands, the fields must be neither in series nor in shunt altogether. Only a compound generator will meet the requirements, for then the current that flows out of the machine will regulate itself in exact proportion to the demand, while turns in series with the fields by passing more current prevent drop in voltage.

As for ability to stand overloads, the machine should be watched for signs of speeding up or slowing down when the operating switch of the transformer is closed for a heavy output of current. Sometimes arcing at the brushes on the D. C. side of the armature is a troublesome indication of overloading when there is no change in speed apparent.

Synchronous motors have little mechanical work to perform in connection with interrupterless transformers. Such a motor is to be judged by the way it behaves, the ease with which it goes into synchronism, and its ability to keep in step. Any tendency to get out is appreciated immediately by the ear as a break in the even whir or steady running sound maintained while the motor is in perfect synchronism. This is to be differentiated from the irregular sounds produced when the commutator is out of step, as it may be by slipping on the motor shaft or only out of step on certain inductance points. Where impedance coils are used instead of a rheostat this is quite likely to happen on one point or another. The synchronous motor is doing the same work at all times, and if it tends to jump out of synchronism it can be detected when no current is going to the transformer.

RHEOSTAT AND CHOKE CONTROL.

The main objection to a rheostat in the primary circuit of the transformer is heat. Of course there must be heat wherever resistance is interposed in a circuit. Waste in current is a small matter in connection with X-ray apparatus if better results can be secured with resistance. Rheostats can be constructed suitably for the purpose; that is, they can be designed to radiate heat quickly enough to permit continued use for half an hour or more without dangerous overheating. By this is meant injurious effect on resistance coils themselves. Greater demands are imposed only by unusual therapeutic efforts, and for such work induction coils labor under the same conditions. Manufacturers of X-ray transformers must build their own rheostats or have them built specially, as there are no suitable ones in the general market at present. Ability to stand heavy currents for comparatively short periods of time and to pass weak currents for half an hour or longer constitute the unusual requirements. A satisfactory rheostat must of necessity be large, and the size of resistance wire on the different spools should vary with the different contacts, according to whether they will only be called upon to pass weak currents or increasingly greater currents as successive spools are cut out of the circuit. The last few spools should be wound with heavy wire. This makes relatively greater jumps from one to another of the last few contacts, but that does not matter. Indeed, it is rather an advantage. The tendency for resistance to increase when the rheostat is hot can be dismissed with a few words. In the first place, a good rheostat will not heat in the short time that current is on for roentgenographic work, and for all work, tube effects are properly controlled by milliampere and volt readings. The rheostat is merely the agent for increasing or decreasing the current, and it is not a matter of much importance if the lever must be changed a point or two during a long exposure.

Reactance, or inductance, in the primary circuit of the transformer is used instead of resistance for controlling current by the Scheidel-Western Co. and the Kny-Scheerer Co. Whether open-core choke coils or closed impedance coils are used the effect is the same. With alternate currents, whenever inductance is interposed in the circuit, a lag in amperage behind voltage occurs, the degree depending upon the amount of inductance. A condenser in an alternating current-circuit tends to produce the opposite effect, a lead in the ampere curve.

Graduated inductance, preferably by numerous closed impedance coils, cut in or out in succession by a single operating lever, will choke the current so that any length of spark from the shortest to the full output of the transformer can be thrown. Choke control will do the work fairly well. It was used with the apparatus on board the U. S. S. *Solace* for the first year, but was later given up for the more convenient control by rheostat. Doubtless most manufacturers have experimented with various means of choking by inductance in the primary circuit of the transformer for, theoretically, it is the ideal method of governing alternating currents and it is practically, except where the current after being stepped up in voltage is to be rectified. Where the object is to obtain an equally pulsating unidirectional current by commutation, the lag, varying from nothing to complete choke, is a disadvantage because the commutator must be set in some one fixed position on the motor shaft and it can not be perfectly in step with more than some one particular degree of reactance. The machine will work well at that because, as was stated in discussing transformers and heating effect on tubes, it does not matter particularly just what the exact relation of the ampere curve may be to the potential curve so long as the maximum amperage in each impulse lies between the points which mark the utilizable portion of the wave. With the commutator set properly for maximum output the machine will not be noticeably out of step until the current is choked down for the lighter effects and here it is not a matter of particular importance.

The conclusion is that choke control can be used successfully with carefully designed reactance, freedom from heating being the important and practically the only advantage, but that a properly constructed rheostat in spite of the heat generated, is to be preferred because the commutator, if set properly, is then always in step no matter what the volume of current or load may be. It might be thought that choke control could be used to advantage in therapeutic work, and that a rheostat in parallel could be used for roentgenographic work, but resistance and reactance can not be used together because with the high-tension commutator properly set for one it will not function within working limits for the other.

X-RAY TUBES.

X-ray tubes were exhibited by the Green & Bauer Co., of Hartford, Conn., Peter Machlett, of New York, Campbell Electric Co., of Lynn, Mass., and the Macalaster, Wiggin Co., of Boston, Mass.

There are certain essential features of X-ray tubes, as built to-day, that determine the quality of work that can be done with them. During evolution, since 1895, all sorts of quaint and odd characteristics have appeared in tubes, but for the most part the best tubes now are stripped of all but working parts and necessary details. To begin with, the tube is built up from a bulb with a tubular neck, in shape much like a round-bottom glass flask. Just opposite the tubular neck the bulb is punctured and a smaller tube of glass is fitted and sealed in place. Into this go the metals comprising the anode. The cathode is sealed in the tube which was the original neck of the flask. Before the metals are put in, the bulb has been tapped on its upper surface and a short glass tube joined on at a point about one-fourth of the distance around from the anodal neck to the cathodal neck. This accessory is to contain the bianode. Then a tube is joined to the bulb on its upper surface at the mid point to hold the asbestos regulator and to provide a terminal for connection with the vacuum pump. This terminal tube is sealed in a flame and covered with a rubber cap after the tube has been exhausted.

ANODE.

The anode consists of a metal tube of copper or wrought iron riveted at the inner end to the copper backing of the target. The iron or copper tube is not a complete cylinder; a gap or open seam is left so that the spring effect holds it in tight contact with the glass neck piece up to the point where the anode extends into the bulb. Sometimes an inner seal of glass is made at this point to add to the support of the heavy metals. The target itself is a disk of some heavy metal having a high fusion point. It is inserted into and backed by a block of pure copper, cut so that the target itself is directed downward at an angle of 45° to the long axis of the anode.

At the present time, tungsten and platinum are the metals chiefly used for targets. Both are heavy elements and both have high fusion points. Tungsten is by far the most suitable for heavy work. Platinum has a place in tubes used only for therapeutic work, but even here it is being supplanted by tungsten to some extent. Silver was highly thought of at one time for treatment tubes, but it melts easily and drops into the bulb. Silver and steel targets are relics of the past. Even platinum is drilled quickly when heavy currents are used. Tungsten will stand more abuse than any other metal tried so far

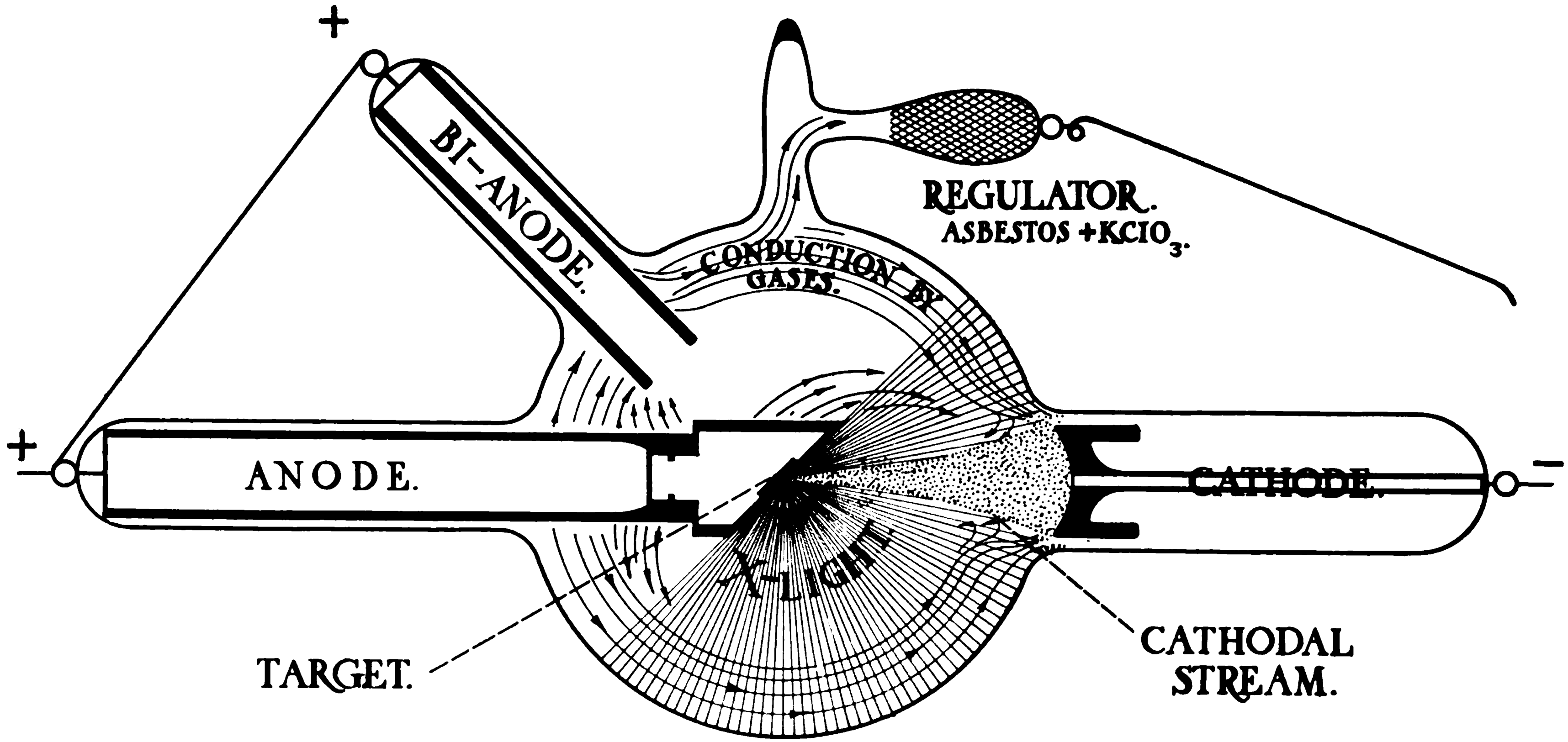


FIG. 10.—DIAGRAM OF X-RAY TUBE SHOWING ESSENTIAL PARTS AND PROBABLE PATHS OF ACTIVITY.

but it will crack and be drilled if a heavy current is left on too long. Fusion without a crack does not hurt the properties of a tube, and a tube may behave well even with a drill hole in the target. Practically all tungsten targets in use in this country are made by the General Electric Co., which holds the patented secret for properly inserting the tungsten disk in copper. One other concern manufactures tungsten targets in the United States. Targets are made up to their anodes by the tube maker, and much depends upon this detail in ability of the target to stand heavy currents for reasonable periods of time without being cracked or drilled. It is largely a question of the rapidity with which heat can be removed from the tungsten and its copper backing by the supporting metal anode. A tubular copper support best serves this end, but it lacks the necessary rigidity, and wrought iron is in general use for that reason. Copper will serve if an outside jacket of steel is used, but the extra metal increases the difficulty of pumping the tube properly. A light wrought-iron tube inside the copper should serve well. Tubes with tungsten targets backed by hollow anodes, which communicate by tubes with the outside atmosphere, permitting a continuous flow of cold or cooled water against the back of the target, serve well for long treatments and fluoroscopic work where little current is used. Here the problem of continuous removal of calories as fast as produced is met satisfactorily. Indications point to some such arrangement in the future for heavy roentgenographic work. There is already a demand for tubes suitable for mixed work, prolonged fluoroscopy, with every now and then a plate made quickly with a current of 80 to 100 milliamperes.

CATHODE.

In this country aluminum is used almost altogether for cathodes, but in England pure washed copper has given satisfaction. The cathode presents a concave surface at the neck of the bulb—a concave mirror, directed as nearly as possible at the center of the target. Its function is to direct the stream of corpuscles, or electrons as they are otherwise termed, to a focus on the target. Conventional cathodes are now bell-shaped and solid, with an aluminum stem supported in a small glass tube, which, in turn, is sealed to the large glass tube at the cathode terminal of the tube, a wire connection which penetrates the glass seal being secured to the metal terminal outside the tube. The cathodal end of the bulb, together with the neck around the aluminum bell, is an exceedingly active part of the X-ray tube, and much heat is liberated here, particularly in tubes where the aluminum cathode is poorly designed or poorly placed. Indeed, there is probably much more action, even behind the concave surface of the aluminum piece, than is generally imagined. The

fact is that much research must be made before satisfactory and complete knowledge can be had of the physics of the cathode and cathodal stream. It is recognized, practically, that definite position and definite size of the cathode piece, relative to the diameter of the glass tube and neck, are important for best work. The cathode must not extend out into the bulb and it must not be set back into the cathode neck beyond a certain point. Probably the correct position is that where the concave mirrorlike surface occupies the space that would be filled by the glass wall if the bulb were unbroken at this point. If the cathode is too small, excessive reaction seems to take place behind it, and overheating occurs. If it is too large, the nearness of its edge to the glass increases the danger of cracking at the neck of the bulb. With improvements in anodes and targets it has become increasingly difficult to design cathodes to balance them by taking care of the necessarily increased degree of heat liberated at the cathode itself when currents taxing heavy anodes are used. It is much like the question of guns and armor plate, and, in fact, the cathode has been likened to a gun—a comparison that is not at all inapt, shooting, as it does, millions of projectiles—electrons—at the target with great velocity, about one-third to one-half the velocity of light, or 62,000 to 93,000 miles per second.

To overcome the danger of tubes cracking at the cathode neck one manufacturer has settled upon a design for which he has secured patent rights. His cathode consists of a short hollow cylinder of aluminum mounted on a hollow stem, the whole punched out of one piece of the metal, with a concave surface presenting to the bulb. A small round aperture in the center of the concave surface opens into the stem. This cathode does not tend to overheat in spite of its light weight. The absence of a flaring edge, or lip, certainly diminishes the likelihood of dangerous discharges against the neck of the bulb, which frequently melt the glass or cause cracking at such points. There is not, however, sufficient reason to believe that this cathode will modify the progress of a tube to its cranky stage, as is claimed. If the tubes do give more service it is because they are pumped well.

BIANODE.

Three forms of bianode are in use; a pointed aluminum rod, a flat disk of aluminum mounted on a stem, and an incomplete tube of wrought iron, similar to the supporting tube of the anode. The bianode is of service in the process of pumping the tube, and some tubes light more evenly or run more steadily if the anode and bianode are connected to the machine in parallel. This is particularly true for tubes of high vacuum.

During the process of exhaustion, tubes are less likely to blacken if the bianode and cathode terminals are used for the current. It is necessary to excite the tube electrically at certain stages during exhaustion in order to secure steady X-ray vacuum. This is spoken of as exhausting or pumping the metals. Under influence of the cathodal stream the metals of the anode become heated and they give up retained gases which they can not be made to give up by any other means. If alternating current is used, the disk form of bianode is most suitable, because then we have cathodal streams focused alternately on the target from the cathode and on the copper backing of the target from the bianode. By this method the anode can be heated to extremely high temperature. If a rectified current is used, possibly the rod-shaped or tubular bianode is more suitable. It is possible to pump a tube properly from the anode with unidirectional current, but most tube makers prefer to use the bianode. It is questionable how much effect the tubular bianode has in trapping gases, and even more questionable what advantage in this respect such an arrangement has over the ordinary glass valve-tube arrangement behind a disk-shaped bianode. The real advantage of the tubular form, extending out into the bulb of the tube, probably lies in the fact that it is similar in form to the shaft of the anode, and conditions being similar at their respective necks, better effect is secured when the tube is excited with the anode and bianode wired in parallel than is the case with the older form of bianode. Under such conditions, with any given tube resistance and a fixed impressed voltage, a voltmeter will read from 3,000 to 10,000 volts lower, according to the vacuum, when the positive pole of the machine is connected to the bianode; showing less tube resistance for the same degree of vacuum than when the tube is lighted from the anode. Wired either way, the tube lights up about the same, and there must be some advantage in having practically two anodes; particularly where rays of considerable penetration are desired, such as 8 Benoist, for on the same output from the transformer a more even flow of electrons is insured to build the cathodal stream when current is flowing from two sources at once, resistance at one of them being a little less than at the other. The transformer tends to put more current through a tube of given resistance, and there is likely to be less difference between lighting voltage and running voltage. At the same time there is less obstruction to the cathodal stream because the vacuum is really high. Judged by the parallel spark gap and milliampere reading, the tube has a low vacuum, and this probably accounts for the claim that tubes of low vacuum give the effect of high vacuum because gases are trapped in the bianode. The vacuum is really high; low vacuum effect, judged from electrical data, is due

to the favorable action of the second anode, an improvement which is to be recommended. Its value is less apparent in tubes actually low in vacuum.

VACUUM.

When the X-ray tube is put on the pumps to be exhausted, certain stages are gone through. First, it shows less resistance to an electric discharge than when at atmospheric pressure. From there on its resistance increases as higher vacuum is created. Soon sparking ceases between the copper margin of the target and the cathode, and the tube is filled with a reddish glow, probably due to the high percentage of nitrogen remaining in the tube. After the red stage the glow, while electric current is passing, becomes more and more blue, and a cathodal ray or stream is visible. The cathodal stream is seen as a ray of light at this stage because of friction, the corpuscles or electrons composing the stream being obstructed in passing by atoms or molecules of gases in the bulb. At this time, no matter what the curvature of the mirror, the cathodal stream is not focused on the target. It either diverges or the rays cross a short distance from the cathode, and much of its energy is dissipated in the gases and against the glass wall in the anodal half of the tube. Besides the spreading part of the stream, there is a central portion, or core, which is sometimes spoken of as the filament. This goes straight across from the cathode to the target. As vacuum increases the blue glow becomes less pronounced, and the point of divergence of the cathode ray is brought down until the stream is wholly directed upon the target, the stream becoming more and more compact. Whenever the vacuum changes, either while the tube is on the pumps or later when in use, the area of the target included in impact of the cathodal stream, the focal spot, also changes in size.

When exhaustion has proceeded to the stage where the cathodal stream is focused on the target, the tube has reached a state of X-ray vacuum, and a hemisphere of yellow light caused by fluorescence or secondary radiation from the glass is seen, due to action of X-rays on the portion of the tube not shielded by the configuration of the anode copper. The state of X-ray vacuum may be said to be just beginning when the tube has reached this stage. X-rays leaving the tube have not sufficient penetration for practical use. X-ray vacuum runs from this point up to the degree of resistance against which the tube can not be lighted by voltages in use at the present time.

During the process of pumping the tube must be activated from time to time by high-tension electric currents, and it is important that it should be lighted by the same kind of current with which it is intended to be used. A transformer should be used to pump a trans-

former tube, and an induction coil should be used for a tube intended for operation with a coil. The reason for using current is that the metals in the tube contain various gases, and unless they are made to give up most of their gases the vacuum will be very unstable and the tube unfit for practical work. The metals can only be exhausted properly by the application of intense local heat while the tube is under influence of the pumps. Proper heating can only be induced by passing current through the tube, although at the same time the tube as a whole is heated to a high temperature in hot air, it being inclosed in a lead box, with a lead glass window, and surrounded by gas jets.

Proper vacuum is determined by resistance and current, although expert judgment of the color and appearance of the tube is valuable. If a pure unidirectional current is used the tube can be pumped, as it is said, from the anode, but if there is any inverse discharge from the apparatus used, the positive wire must be connected to the bianode to prevent the tube from blackening—a condition which tends to result in a cranky tube. When a transformer is used for pumping, the nonrectified or alternating current can be used by connecting to the cathode and bianode. Wave quality is the same, and as soon as the vacuum has risen sufficiently two cathodal streams can be focused on the anode alternately from the cathode and bianode, the latter acting as cathode with every other impulse, and focus from the flat disk is sufficiently sharp to heat a spot white on the copper backing of the target. As soon as the state of vacuum permits a cathodal stream to be brought to a focal point on the anode gases are liberated from the metals with a rush, and shortly after the vacuum rises quickly.

This completes the process of exhausting the tube, and after it has been sealed and removed from the pump it is put aside until it has thoroughly cooled before it is tested on an X-ray machine. Until then its qualities can not be known exactly.

The time required for properly exhausting a tube varies with the pumps used and, among other conditions, the state of weather, barometric pressure, and relative humidity. In general, from half an hour to three hours is required. In the Jefferson Laboratory of Physics, Harvard University, it was found that X-ray vacuum could be produced in two or three minutes by the new molecular pump, an importation from Germany. When mercury pumps are used, mercury vapor tends to get into the tube, and occasionally it remains in spite of high vacuum. Precautions are taken to prevent an excess of water vapor from accumulating and remaining by drawing the exhausted air through a reservoir containing absorbent chemicals, such as the pentoxide of phosphorus, phosphoric anhydride.

After exhaustion the tube must yet contain some gas. The most powerful currents will not break through an absolute vacuum, and it is comparatively easy to pump beyond the point where ordinary transformer currents will light the tube. The nature of the gases remaining in the tube is a matter of great importance, largely determining tube characteristics. Small traces of nitrogen cause a pink light in the vicinity of terminals, and a general watery color, the more noticeable the lower the vacuum. Tubes which contain nitrogen are cranky in action and have more resistance, electrically, than they should have for the given degree of vacuum, although tubes containing nitrogen do not always behave in the same way. If properly exhausted to begin with, a tube may stand admission of small quantities of nitrogen, as, for example, through an "air regulator," and yet maintain good working qualities for a considerable period of time. However, regulation that admits air into the tube is at best a poor method of reducing vacuum. The tendency is for the tube to become more and more freaky, and for X-rays to have less and less penetration for the length of spark backed on the parallel gap. In general, tubes containing nitrogen rise quickly in vacuum or resistance while they are lighted, especially if there is any inverse discharge to the current. This applies more particularly to unseasoned tubes. If nitrogen has entered through a leak around a terminal, the tube is bound shortly to become useless. Any unseasoned tube may be raised in vacuum by reversing electric connections, but a tube showing pink light rises in vacuum much more quickly. At least resistance to the electric current rises.

There are other causes leading to crankiness, and other causes of pink light, besides nitrogen. Argon and other rare gaseous elements found in air probably interfere with good tube qualities, but they must be present in such minute quantities as to be negligible. Helium is another undesirable element, but it can not be present in troublesome amount in a new tube. Helium is formed from radium, and present opinion is that it is also created in the X-ray tube during action. If so, it must gradually increase in quantity during seasoning of the tube, for the evidence is that none of the electrically inert elements can leave the tube. No gas can really leave the tube except through a vacuum pump.

Gases which lend themselves to favorable action in the tube are oxygen, hydrogen, and water vapor. To the last, of course, the laws of Boyle and Charles apply just as they do to either of the elements alone, and since hydrogen and oxygen differ electrically; acting, in their chemical affinities, as ions of opposite signs, if they both have good effect in an X-ray tube, it naturally follows that water in a gaseous state will act likewise. It is a debatable question which is better, oxygen or hydrogen. Certainly the ordinary asbestos regulator which has been soaked in potassium chlorate solu-

tion, or rubbed in the dry substance, gives up oxygen when heated by passing current through it, and it is a matter of every-day experience that reduction of vacuum in this way does not injure the tube. Of course, part of the reduction may be due to expulsion of water vapor, for the tube tends to go up in vacuum again shortly afterwards. On the other hand, admission of hydrogen to the tube also has a favorable effect on X-ray quality, and it is a question whether hydrogen is not better than oxygen for the tube, in the long run. The electronic structure of its atom is simpler than that of oxygen; it being assumed that 1,000 corpuscles constitute the mass of an atom of hydrogen, while the oxygen atom is composed of approximately 16 times as many, necessarily permitting more complex configuration. The hydrogen atom already has less weight than the atom of helium, and if helium is created as the result of dissociation of either element, oxygen would be the one suspected. However, these considerations need not necessarily apply, as other gases enter the bulb from the contained metals.

THE X-RAY TUBE IN ACTION.

X-rays were formerly considered to be transversal disturbances in the luminiferous ether, or waves transmitted in one plane only, incapable of refraction, reflection, and polarization. Now, it seems perfectly proper to speak of X-light. Prof. C. G. Barkla, backed by Sir J. J. Thompson and Dr. E. Rutherford, classes X-rays unequivocally as light waves, obeying all the general laws of light. On account of the extremely short wave-length, about one ten-thousandth the wave-length of ordinary light, only diffuse reflection occurs from ordinary surfaces. For regular reflection it is estimated that surface smoothness, the result of cleavage planes between individual atoms of crystals would be required. Polarization phenomena correspond to those of ordinary light. Secondary radiation, resulting in fluorescent light, shows a greater wave-length than the primary or exciting ray. Practically, shadows cast by X-rays, as recorded on the photographic plate, are remarkably sharp. All substances are penetrated in inverse proportion to thickness and specific density, atomic, and molecular weights. X-light waves are propagated at the speed of ordinary light. Absorption follows Sir J. J. Thompson's law, that every unit of thickness penetrated absorbs a definite percentage of light energy, depending upon relative penetration of the ray and density of the absorbent medium.

In considering what occurs in the X-ray tube to produce X-light, a reasonably good tube and one that has not been seasoned to its cranky state is assumed. In a normally acting tube, experiments show that penetration of rays emitted is directly related to voltage

maintained on tube terminals. In general, this is governed by tube vacuum, expressed electrically as resistance, although experiments with the Cabot high potential D. C. converter show that penetration can be controlled within certain limits independently of fixed tube resistance or vacuum by varying the potential at the poles of the machine. In lesser degree this is true also of ordinary unidirectional transformer currents. The quantity of X-light produced is directly proportional to the amount of current used or, in other words, to the amount of energy put into the tube and directly related to the quantity of heat produced under fixed vacuum resistance. X-rays have their inception at the target by impact of the cathodal stream. This stream is considered to be composed of electrons, negative units of electricity. Electrons are otherwise known as corpuscles, because, under the electronic theory of matter, they have definite mass, corresponding to their velocities, and they represent the ultimate chemical division of the atom, irrespective of the element from which derived. The corpuscular electron may be regarded as a bullet or projectile, most minute in size. The cathode is the gun which fires them straight at the target. Velocity of these projectiles depends upon vacuum of the tube, and, as stated, to some extent upon the pressure under which current enters the tube. If the vacuum is low there are more atoms and molecules of the various gases encountered in the flight of electrons from the cathode to the target; more atoms to be bumped into and rubbed against. If the tube is very low in vacuum, sufficient friction is created by the obstructing gaseous atoms and molecules to produce a bluish or reddish glow, revealing the cathodal stream to the eye. In the latter event, so much of the kinetic energy of the stream is dissipated before it is impacted on the target that X-rays produced are very weak and are not sufficiently penetrating for any practical use. Electrons in the cathodal stream are estimated to travel at about one-third to one-half the speed of light in air, or up to 93,000 miles per second. It is probable that gases also enter into the formation of the filament or cathodal stream, probably being carried along in particles by motion imparted from free corpuscles or as the result of attraction between electric charges of unlike signs. Such gases upon arriving at the target must divide and establish currents to the periphery of the bulb, later taking a general direction along the margin toward the cathode again.

It is a question whether free electrons in the cathodal stream come from the current discharged through the tube by the electrical machine, or whether they come directly from gases within the tube, under influence of the electric current. Both views may be correct. At any rate, judged by quantity of X-light produced, density or quantity of the stream is directly proportional to the volume of current

put through the tube. The practical consideration is that a path of conductivity must be established for current to flow. In present X-ray tubes, electrically active gases are required, such as hydrogen and oxygen, whose molecules or atoms are capable of receiving electric charges and handing them on to other atoms or conducting to the cathode. In virtue of the fact that only one kind of electricity really exists, and that negative electricity; on the assumption that contemporary views of positive and negative poles of an electrical machine are wrong, opinion has been expressed that current enters the X-ray tube through the cathode. However, there seems to be little reason to doubt that pressure is really exerted on the anode, and that current flows through the tube to the cathode. At any rate, experiments with galvanic cells show the milliamperemeter needle to indicate the current as flowing from the carbon, the tube being connected as it would be, anode to carbon, if a battery of, say, 40,000 cells in series were used to light the tube. So far as we know, in the case of a galvanic battery, the direction of flow in the external circuit is from carbon to zinc. Practically, it can be assumed that electric current flows through the bulb from anode to cathode, the tube acting like any other piece of electrical apparatus capable of doing work. It absorbs energy in the form of electric current and changes it into heat and other forms of energy. The tube, like an incandescent lamp or a motor, puts certain resistance in the circuit, and, in accordance with Ohm's law, current flowing is proportional to impressed voltage. The proportion is exact with continuous current and nonfluctuating voltage, but with the alternating current wave higher voltage is required to force a given number of amperes through the same resistance. The exact relation can be determined only by geometrically plotting both volt and ampere curves; that is, Ohm's law does not apply directly. The voltmeter and current meter both demonstrate the tube to act as an electrical machine, but it is interesting to speculate on what happens in the tube while current is flowing.

If the tube is punctured, there is simply a spark gap between nearest metal points on anode and cathode, and sparking occurs just as it does between terminals of the machine—across an air gap. With X-ray vacuum, however, there is reason to believe that current flows around the bulb, keeping well to the periphery, from anode neck to cathode neck of the tube, and that no current, or at most a negligible quantity, flows directly from copper to aluminum. Since current will not flow unless there is sufficient quantity of active gases in the tube, it can well be assumed that these gases play an active part in conveying current to the cathode terminal. How they act is pure speculation—whether by ordinary conduction or by static charges. At any rate, a strong static field is created in the vicinity of the X-ray tube while it is lighted, and certain condenser

effects can be shown to modify tube action. A tube so low in vacuum that it lights blue may light yellow if held in the hand. According to modern ideas, dynamic electricity and static electricity are one and the same substance, only in the latter case free electrons are held bound to a surface instead of being handed on continuously or successively replacing electrons in molecules along a conducting medium. Wherever we have high-tension currents, static effects follow. It is possible that the glass wall of the tube acts like the stationary disk in a static machine built on the induction principle, a charge being induced on the glass inside the tube opposite in sign to the charge entering the tube; and at the same time the charge induced outside the tube, by gradually leaking away is grounded, thus leaving a charge in the tube which can not be neutralized and which is repelled from the cathode. This is one way of accounting for free electrons supplied to the cathodal stream. Punctures in X-ray tubes, due to surges in current, occur almost always at a certain point in the neck where the anode enters the bulb, and they indicate sudden accumulations similar to static charges. It is probable that the glass is punctured from within outward if the discharge between oppositely charged bodies can be said to take place from one more than the other.

X-ray tubes in use tend always to rise in vacuum, and this fact suggests that active gases are used up or destroyed in the tube. Oxygen combined into ozone naturally results in rarefaction without destruction of its atoms. What changes hydrogen may undergo are not known. Traces of helium found in seasoned tubes would seem to indicate rearrangement of atomic structure under electrical influence similar in many respects to that which occurs in the case of radioactive elements like radium. If so, some of the gases in the tube are actually used up. Nitrogen does not seem to be affected.

It seems likely that at least three effects follow when current is turned on the tube: conduction around the bulb by suitable gases; induction of static charges which break from one particle to another only to be repelled from the cathode end of the bulb by like charges; and partial dissociation of gaseous atoms with liberation of free electrons. The vicinity of the cathode is a very active part of the tube. A concave surface on the cathode gives best results but not altogether because of focussing effect such as a concave mirror has on light waves. A plain surface will give a fairly sharp focus on the target and with a concave cathode it makes little difference, within certain limits, what the distance is between cathode and target, providing it is great enough. The most important single factor controlling sharpness of focus is vacuum. With that there is to be considered the radius of curvature of the concave cathode surface and effect of magnetic or electrical attraction and repulsion. The

cathodal stream is essentially electrical and at the same time it is a stream of actual matter. It can penetrate aluminum, as shown by Lenard, and it can be drawn or bent by a magnet. It can discharge charged bodies, as shown by the electroscope. Considered as a concave mirror, the radius of curvature of the cathode surface gives it a definite focus and rays of light reflected from it would converge to the focal point, cross, and then diverge; but, considering the cathodal stream as consisting of innumerable bullets thrown from the concave surface, even if they all left in radii of curvature, they would not continue in diverging courses after meeting at the focal point. Instead, the energy of some would be spent in collision with others coming from the opposite side of the mirror; some would break through the line at the focal point and scatter; and the rest, yielding to lines of force, would be urged on in a compact cylindrical stream to impact on the target. Moreover, there seems to be little doubt that electrical forces at the cathode end of the bulb strongly repel the units of the stream, tending to compress them into a compact column. This is probably like the effect on pith balls under the influence of similar electrostatic charges, explainable under the assumption that similar units of electricity are traveling along the bulb in the direction of the cathode.

Considerable action takes place behind the cathode, probably due to expenditure of energy by electrons which have escaped between the cathode and glass or have penetrated thinner parts of the aluminum. Placing the cathode back a little, out of the bulb, tends to prevent dangerous action here. The cathode should not have a thin or flaring edge. Sharp or ragged edges promote wild action of electrons at the neck, and the glass is in danger. A single saw-tooth point on the edge of the aluminum mirror may direct a stream of electrons at a spot on the neck of the tube, when the vacuum is at the right point, until the glass melts and is forced in by atmospheric pressure.

VACUUM REGULATORS.

Three methods of regulation are chiefly used at present; chemical regulation, operated by the electric current through a shunt circuit: osmotic regulation by means of a palladium wire sealed in the tube: and air regulation as used on the Muehler water-cooled tube.

Chemical regulator.—This consists of a collection of some oxidizing agent in a small horizontal accessory tube attached to a vertical tube which in turn is joined to the top of the bulb. Usually the chemical is potassium chlorate, held in place by asbestos wool. It is operated by passing a part of the electric current through it. This can be done by attaching the negative wire from the machine directly to the regulator terminal, but usually the tube is supplied with an ad-

justable wire that can be bent down to the cathode terminal, thus allowing part of the current to pass through the regulator. A more convenient method is to have an adjustable series spark gap on the transformer cabinet, arranged so that it can be manipulated from the switchboard. With a third wire from the regulator to the adjustable spark gap the shunt circuit can be made at will, quickly and without leaving the control panel. Such an arrangement is very desirable because the vacuum frequently rises again quickly after reduction by means of the chemical regulator. When current is passed through the asbestos containing potassium chlorate, heat is generated and oxygen gas is liberated. It is probable that a small quantity of aqueous vapor is also thrown into the tube. This is quickly reabsorbed as the tube cools, accounting largely for the rapid return to constant vacuum after reduction by passing gentle current through the regulator. If heavy current is used the reduction is more or less permanent and recovery follows only after much seasoning in the natural use of the tube. This regulator can be sold only under the Queen-Sayen patent, at present owned by the Green & Bauer Co., of Hartford, Conn. Other manufacturers pay them for the privilege of so equipping their tubes because in many respects it is the most satisfactory method of regulating up to the present time.

Tubes vary greatly in respect to sensitiveness of their regulators, due chiefly to conditions under which they are exhausted. Some manufacturers supply tubes which, on the average, are noted for being raw. In such cases the metals have not been thoroughly exhausted and the regulators are likely to be very sensitive. Much seasoning is required before such tubes acquire the property of holding steady vacuum against heavy currents and heating from continued use. Some operators prefer the method whereby the tube is seasoned to a considerable extent while on the pumps, so that it is ready to do heavy work when received from the factory. The regulator in this case is not oversensitive but yet sufficiently so to reduce vacuum way below working conditions if heavy current is inadvertently allowed to pass through it. It is largely a matter of choice, but there is more danger of ruining the raw and unseasoned tube by carelessness. Seasoning is largely a question of exhausting the metals. Active life for real work is about the same. All tubes finally reach a cranky state, with residual active gases used up, the metals completely exhausted, the regulator worn out, and decomposition products from metals, gases, and regulator in the tube. All tubes do not react alike to these conditions. The most typical warning of approach to a useless cranky state is the necessity for vigorous regulation before the tube can be lighted. That is, lighting voltage becomes very high and the vacuum can only be reduced with difficulty to allow any current to pass. Once lighted, a large volume of cur-

rent flows immediately, the tube behaving as if it were of low vacuum. Once lighted the tube may behave well for the rest of the day. Some tubes pass through such a critical period and enter upon another life of usefulness. Some become more and more obstinate until finally when lighted they are unfit for use. Other tubes upon reaching the critical period go "crazy," and these usually show a reddish or pink glow, due to the presence of electrically inert gases or decomposition products. Such tubes tend to go up quickly in resistance when lighted, or they vary, lighting and going out without regard to the current used. They are quite unfit for service. A well-seasoned tube during its period of usefulness maintains constant vacuum during a reasonable exposure, or it tends to go up a little, but gradually in vacuum, particularly if it has been reduced for the exposure. A good tube can be restored after it has reached the crank stage by fitting it with a new regulator and repumping. Often nothing can be done with crazy tubes, although sometimes they can be washed out with alcohol if not too black from carbon deposits on the glass. A good deal depends upon the condition of the metals. Manufacturers seem to consider that the metals finally become too exhausted to give good results, and that it is not worth while to use them over again. They can be partly restored for use in rebuilt tubes by heating them dull red repeatedly in air.

The advantage of the shunt circuit chemical regulator, asbestos or oxygen regulator, is that it can be easily operated from the switchboard, permitting quick and accurate adjustment of vacuum just before exposing a plate.

Osmosis regulator.—This has been a successful feature of the earlier Gundelach tubes. The usual arrangement is a piece of palladium wire attached to the anode inside the tube, a tight seal being made where it perforates the glass, and a piece about 2 inches long is left outside the tube, protected by an aluminum guard, to be heated by an alcohol flame. Palladium has the property of absorbing many volumes of gas, particularly hydrogen, and it gives up a part of its gas under gentle heat. It is difficult to seal palladium in glass, but this can be done successfully by fusing or jacketing with platinum and then sealing around the latter. Much care must be exercised in selecting palladium wire that is not porous, in order to insure against leakage of air into the tube. Entrance of nitrogen quickly results in making the tube crazy. Heated gently in a blue flame until the wire is dull red, the chances are that only hydrogen gas will get into the palladium and only hydrogen will escape from the end inside the vacuum chamber. Only a small Bunsen gas burner or a blue alcohol flame should be used. Other gases may finally get into the tube if a yellow flame from a match or candle be used. The chief dangers are porosity of the metal; intermittent leaks through the seal, due

to differences in expansion; and blocking of the palladium after a certain amount of service, so that the regulator will no longer work. On account of these conditions, tubes equipped with osmosis regulators vary considerably in quality. When a good one is secured, it is very satisfactory in action, and its life is long. Possibly the active gas, hydrogen, can be used to better advantage than the active gas, oxygen, because of less inert after effect on the conductivity of electricity through gases in the tube. The objection to osmosis regulation is that the switchboard must be left, and each time the palladium wire is heated the tube is reduced by guesswork, which may result in getting the vacuum too low. However, the danger of overreduction is not great in the hands of those who are used to the method. Hydrogen is actually put into the tube, and since it can not be reabsorbed or used up except very gradually while the tube is lighted. the disadvantage of having to leave the switch is not as great as it would seem to be, for with transformer currents, free from inverse discharges, properly acting tubes do not require adjustment very frequently. A tube may do a whole day's work, or more, before it becomes necessary to lower its vacuum again. At any rate, adjusted to proper indicated voltage, the tube can be trusted to hold the same vacuum while a patient is gotten ready for roentgenographic work. and this is of considerable advantage in making stereoscopic plates of deep parts, such as the skull, where it is important to use rays of the same penetration for both plates, with short exposures. The danger of overreducing is not great if only gentle heat is applied to the palladium wire momentarily, the tube being tried after each application of heat until the vacuum is just right. Osmosis regulators do not work so well with induction coils, as the tubes tend to go up quicker on account of inverse currents.

The vacuum of any reasonably good tube can be raised safely by passing weak currents through the tube in the opposite direction. The positive wire of the machine should be attached to the cathode of the tube, and the negative wire to the bianode. Two or three milliamperes should be used for 5 to 10 minutes, or until the required spark is backed up on the parallel gap; until the required voltage is maintained on tube terminals in case a voltmeter is used. Care must be used not to overheat the bianode. This method of raising vacuum is very useful at times, but a practice should not be made of it, because probably it does not do the tube any particular good, and its effect is not to be compared with proper seasoning. However, one of the most experienced tube makers in the country is authority for the statement that he uses the method for new tubes which are not sufficiently high in vacuum when taken from the pumps. Tubes treated once or twice in this way probably suffer no particular harm.

Air regulators.—As used on the Muehler water-cooled tungsten target treatment, or fluoroscopic tube, the air regulator consists of a

system of capillary tubes containing mercury which serves as a lock, acting like a mercury vacuum pump worked backward, as it were. The regulator is operated by means of a rubber bulb or metal piston pump, held in the operator's hand, and connected to the regulator on the tube by rubber tubing. By compression, air is forced into the capillary system of tubes, and in displacing the column of mercury a minute quantity of air escapes into the X-ray tube. The best that can be said of this regulator is that it is very convenient for fluoroscopic work. The roentgenologist, holding the bulb in his hand, is able to reduce penetration at will, while examining his patient behind the fluoroscopic screen. The surprising thing is that tubes stand admission of air as long as they do without becoming cranky. As one would expect, they tend to become more and more pink. There is no evidence that nitrogen can leave the tube except by being pumped out and, theoretically, any method is to be condemned which puts air into the tube, because it is of the greatest importance in pumping tubes to remove all traces of nitrogen.

The so-called helium regulator.—Spectroscopic examination of used tubes reveals the presence of helium gas in minute quantities. There is no reason for believing that this gas or other inert gases—argon, neon, etc.—so long indistinguishable from nitrogen, can act in any beneficial way within the tube, so the use of helium for regulating vacuum would not seem to be justifiable even if it could be used. As a matter of fact, it is a reasonable calculation that its presence in appreciable amounts would be quite harmful to the tube, as its production is associated with liberation of much heat and the gas itself is inert for electrical purposes. So far as is known, helium, except in connection with the cathode discharge, can only be produced from matter containing radioactive elements, and if such matter is used as the chemical for this regulator, the quantity used is so small that the helium yield must be infinitesimal.

Electron regulation.—There is no tube with such regulation on the market at present, yet certain theoretical considerations point to it as the tube of the future. It is known that the General Electric Co. is experimenting with regulators along these lines at Schenectady, N. Y., and other investigators are also at work. The disadvantages of having any kind of gas in the tube must be apparent, if conductivity of electricity through the tube can be established and maintained in any other way. It is a well-known fact that free corpuscles of matter, or electrons, are given off from naked flames, electric arcs, incandescent filaments, etc. For example, a properly charged electroscope can be discharged by bringing it into the neighborhood of a candle flame. The air about the flame is said to be ionized, and greater conductivity of electricity is afforded. The proposition is to pump the tube much higher than for X-ray vacuum, to remove,

so far as is possible, all gases. Then, with one or more filaments of suitable metal, preferably tungsten, heated by an independent electric current of comparatively low voltage, derived from the transformer and controlled from the switchboard, to throw sufficient free electrons into the tube for immediate needs. The high-tension transformer current is expected to find a path of conductivity through the tube from anode to cathode across free electrons liberated from the hot tungsten filament. If tube resistance is too great, resulting in high voltage on tube terminals, and X-rays of too high penetration, more current is to be put through the tungsten filament to increase the number of electrons thrown off, which will result in lessened penetration of X-rays emitted from the tube. If the method is found to be wholly practicable, it will open a new era in X-ray tube construction.

SOME CONCLUSIONS IN REGARD TO X-RAY TUBES.

The simplest tubes are the best; pointers, directors, or wire loops attached to the anode add nothing to working efficiency, and they may do harm. Within the limits of reasonably good action, it may be said that tubes are tubes. That is, with a reasonably good tube the kind of work done will depend upon its vacuum, voltage maintained on terminals, and the amount of current used. The same kind of work can be done with a tube of one make as with another, using the same factors. However, no two tubes are exactly alike, and good tubes are essential for satisfactory work. By a reasonably good tube is meant one that has a low degree of electrical resistance for its state of vacuum; one with a sharp focus, and ability to maintain its focus during exposure. The last condition implies steady vacuum, for the focus changes whenever the vacuum changes. Sharpness of focus can be determined by the size of the spot marked on the target by the cathodal stream. A spot about one-sixteenth of an inch in diameter is about right for a moderately high tube. If the target is marked while the vacuum is low, the spot will be larger. Generally, inspection will show two well-defined markings on the target, one within the other. If the focal spot has wandered from its original site, it means that the metal parts, anode or cathode, have not held their positions rigidly under heating. No harm may have been done if the new focus is sharp. When the target is not marked, sharpness of focus can only be estimated by making exposures of familiar parts at the near distance, say, a hand or side view of a foot, at 18 inches from the target. If the focus is sharp, details of bone structure will be shown, clear and distinct, on the plate. The nearer the tube is to the plate the more severe the test.

Reasonably good tubes are supplied by all the manufacturers mentioned above. Length of usefulness depends so much upon individ-

ual idiosyncrasies and the way in which the tube is handled that it would not be fair to consider one tube to the exclusion of other makes. Quite naturally, individual preference varies. The best tube is the one with which the operator is most familiar. In determining preference the considerations discussed above may be helpful. It is often satisfactory to have two or three different kinds of tubes. Gundelach glass and General Electric tungsten targets are desirable. As a matter of fact, most tube makers use both of these. Seven-inch bulbs are most satisfactory. The 6-inch bulb does not stand the heat well with heavy transformer currents, and no particular advantage is derived from the 8-inch bulb for ordinary work. The target is the key to the situation, and a 7-inch bulb is pretty well suited to the present type of targets, although it is possible that a larger bulb may be demonstrated to be better.

In examining tubes much more information can be obtained after the tube has been lighted a few times with sufficient current to mark the target slightly at the focal spot. The cathode mirror will also be marked by heat, resulting in an area of bluish or brownish discoloration. This area will be circular and in the center of the mirror if the cathode is well placed. Sometimes only the rim of the mirror is discolored. This usually means poor focus or improper relation of the cathode to the neck of the tube. With certain states of vacuum the tube may do satisfactory work in spite of this, but the condition is undesirable. When the area of discoloration on the cathode is not circular, or is mostly on one side of the mirror, or extends to some particular point on the rim, or when rough edges can be seen on the rim, the tube should be rejected, as there is danger of cracking the glass at the cathode neck.

When the tube is lighted, a short spark length backed across the parallel spark gap, in proportion to voltage maintained on the terminals of the tube, is desirable, indicating, as a rule, low resistance for the degree of vacuum. These conditions allow some estimation of the nature of gases within the tube. For example, a tube showing pressure of 75,000 volts on terminals, with moderate current, 20 milliamperes, is likely to be a better tube if it backs up 4 inches of parallel spark than if it backs 6 or 7 inches.

The best technique seems to demand only normal tubes of conventional design for both roentgenographic and therapeutic work. Tubes of peculiar shape and tubes filled with hydrocarbon oil, while they work well enough and produce X-rays of good quality, do not seem to be required, except for very unusual demands. In water-cooled tubes it is an advantage to have the anode set into the tube at an angle on the upper part of the bulb, filling the space usually occupied by the bianode. Great possibilities are open to tubes with tungsten targets, cooled by continuous flow of water.

TYPHOID PERFORATION.

Five operations, with three recoveries.

By G. G. HOLLADAY, assistant surgeon, Medical Reserve Corps, United States Navy.

My work with typhoid perforations has been limited to five cases of ulcers perforating in persons whose histories, together with the Widal reaction, showed them to be suffering from typhoid fever. There have been several other cases of perforations which I regarded as suspicious, but in some the Widal was negative, and in others the histories were so unsatisfactory that I do not count them as typhoid perforations.

Of the five cases here reported, three patients recovered and left the hospital well; one patient lived for over a week and had had several times a normal pulse and temperature, when she suffered a second perforation and died; while the remaining patient was practically moribund upon reaching the hospital. (Ulcer had perforated 44 hours before I saw him.)

Of the five cases but one was in the hospital when the perforation occurred; the others had to be carried varying distances to the hospital in an ambulance. In all the cases the perforation was sudden, and in several followed some imprudence on the part of the patient.

In each case there was but one perforation (though in one case another ulcer was so nearly through that I whipped it over), and in all the cases the perforation was within 2 feet of the ileocecal valve. In all the cases but one there was much soiling of the peritoneal cavity with fecal matter. In no case was the time that elapsed between the perforating and the operation less than 12 hours, and in two cases it was over 40 hours.

The period of the disease when perforation occurred varied from the tenth to the twenty-fourth day.

Pain in three cases was greater on the left side, and in each of these cases the rigidity was more marked on the left side. The amount of pain varied greatly, for while in one patient it appeared to be agonizing, with another it seemed more a feeling of discomfort than actual pain. In these patients nausea was not a prominent symptom, though two patients were nauseated. None of the five cases had had any intestinal hemorrhage.

As to the symptoms at the time of, and immediately after, the perforation, I can say but little of my own knowledge, as I saw none of the patients for some hours (10 hours the earliest) afterwards. When I saw the patients the symptoms varied somewhat, but in all there were pain, tenderness, rigidity, fever, and increased pulse rate, with an increase in the number of respirations; in four cases there was distention, in two very marked, in one a diffuse suppurative peritonitis. In one case (and this man had by far the largest perfora-

tion) there was absolutely no distention, and when first seen his temperature was 99° and his pulse 90.

In three cases the abdomen was opened at the edge of the right rectus muscle, and in two cases in the median line. Drainage, both split tubes and gauze, was used in all cases, except one, and in all but one of the cases the abdominal cavity was irrigated with normal salt solution. In those cases opened through the right rectus incision a suprapubic stab wound was made and a small drain put in the pelvis. I found more drainage on the dressings from this than from the other drains. I believe that if there be much soiling of the cavity by feces it is necessary to irrigate, but if there be no fecal matter, or but very little, irrigation is not necessary.

The aftertreatment was such as would be followed after any laparotomy plus such treatment as the patient's condition demanded from the typhoid fever. If the patient's condition justifies it, Fowler's position should be made use of and saline given by rectum. Stimulants should be given as required. By a careful arrangement of the dressings sponge baths may be given when indicated.

Case I.—Y. W. A., male, laborer, 37 years of age. He had been sick with typhoid between two and three weeks when one night he was seized with an intense pain in the right side of his abdomen and collapsed. Forty-four hours later he was brought to the hospital, where I first saw him. At that time he was almost moribund, but, as a desperate chance, an operation was decided upon. After he had been given a few whiffs of ether his abdomen was opened in the median line, when a diffuse suppurative peritonitis was found, with pus and fecal matter everywhere. One large perforation was found about 15 inches from the ileocecal valve, and near it were several other ulcers so near perforating that a resection was done. The abdomen was well irrigated, drains were put in, and the patient was put to bed. He rallied from the operation, but died that night.

Case II.—H. D. E., male, mechanic, 23 years of age. I saw patient at 6 p. m. when the following history was obtained: He had been confined to his bed for 10 days, but had been feeling very badly for some time before he gave up. That morning between 7 and 8 o'clock he had gotten up and gone downstairs to get a glass of milk. A little later he had gotten up again to go to the bathroom to the stool. As soon as he returned to bed after his second trip he was seized with a violent pain in the left side of his abdomen. He sent for his physician, who gave him some medicine (morphine) and had an ice bag applied. The pain had been increasing all day. When I saw him his face was drawn and pinched and his expression anxious. His abdomen was distended, tender, and very rigid. He appeared to be suffering intensely. His temperature was 100°, his pulse 110. He was at once carried to the hospital and operated upon between

7 and 8 p. m. Under ether anesthesia his abdomen was opened in the median line and a beginning peritonitis was found with large amounts of fluid and fecal matter free in the cavity and large heavy masses of lymph on the intestines. About 20 inches from the ileocecal valve there was a perforation three-eighths of an inch in diameter and near by an ulcer, which was on the point of perforating. I sutured the perforation and turned in the ulcer, using Gould's suture in each case; irrigated the abdominal cavity, put in drains, and had the patient conveyed to bed. As his condition was good I put him in Fowler's position and ordered saline by rectum every six hours.

His convalescence was easy and uneventful. Widal reaction, positive.

Case III.—W. M., female, 23 years of age. Patient was brought to the hospital to be treated for general peritonitis of unknown origin. She had been seen by a physician for the first time the evening before and as she was delirious he could get no history from her and none from her friend except that "the girl had been sick around two weeks and yesterday had complained of great pain in her stomach and had cramps all day."

When I saw the patient she was still delirious and appeared very ill. Her abdomen was greatly distended, her temperature 102°, her pulse 140. Under ether an incision was made at the outer border of the right rectus and a diffuse suppurative peritonitis was found with much free fluid and fecal matter and the intestines were badly matted together. Several ulcers could be detected and one had perforated about 16 inches from the valve. Abdomen was irrigated, drains were put in, and the patient was put to bed. For the next 48 hours her condition was desperate. Then there was some improvement and by the end of the third day she was rational and seemed to be doing well. On the fifth day her temperature and pulse were normal and so on until the seventh day, when there was a rise of fever and an increase of pulse rate. On the eighth day she was much worse and during that night had a second perforation and died on the ninth day after the operation. Widal reaction, positive.

Case IV.—P. D., male, mechanic, 18 years of age. He had been sick about three weeks (in the hospital with typhoid fever for nine days). For two days his temperature had been normal and at 12 noon his temperature was normal, but at 12.30 p. m. he began to complain of pain in abdomen on left side and seemed restless and in distress, for which he was given codeine and an ice bag was applied. Pain continued all day, though it never seemed very great, more of a discomfort, I am told. His temperature, too, gradually rose until at 7 p. m. it was 104°. Then it began to drop some and his pulse to increase. I saw him in consultation at 1 a. m., at which time his

temperature was 102°, his pulse 136, abdomen flat but tender and rigid; face drawn and pinched, expression anxious, general condition fair and pain not severe, more of a discomfort.

I opened his abdomen under ether and found a perforation 14 inches from the ileocecal valve. This was quite a large perforation, and there was quite a bit of free fluid in the cavity, though but little fecal matter. Abdominal cavity was irrigated and drained. Convalescence was easy and rapid. Widal reaction, positive.

Case V.—S. E., female, 14 years of age. Patient had been running a temperature for between three and four weeks, but during that time it had been found to be normal four or five times. At bedtime one night it was normal and the girl ate two peaches. The next morning she was in great pain (cramps) and had nausea. Her physician was sent for and prescribed codeine and citrate of magnesia. Her pain increased during the day and at night she was very ill. I saw her that night in consultation and found a well-nourished young girl who looked to be very ill; her expression was bad; she had a clammy perspiration; temperature, 100°; pulse, 116; respirations, 22. There was very marked abdominal rigidity, and a greatly distended abdomen with marked tenderness over its whole surface, though more marked in the region of McBurney's point. She had vomited once or twice and her bowels had moved. She was at once removed to the hospital, where she was operated upon. Upon opening her abdomen I could at first find nothing to account for her symptoms, although ulcers were seen in several places; her appendix was normal; there was no free fluid; and when I was about to give up in despair I found a teatlike projection on the small intestine about 20 inches from the ileo-cecal valve. This, upon examination, proved to be an ulcer which had gone through all the coats of the intestine except the peritoneal and had pouched that out. This was tucked in and whipped over. The abdominal cavity was closed without irrigation or drainage and the patient put to bed. Her convalescence had nothing of interest except that for some weeks she ran a temperature, even long after her wound had healed and dressings had been left off. Widal reaction, positive.

It will be noticed that in all these cases except Case I there was a positive Widal reaction, and all except Case II had been diagnosticated as typhoid fever by the attending physicians before the Widal test, except Case III, who had had no physician.

In connection with the above cases, I think that this case may prove of interest. This patient, a girl of 17 years, had been in bed for three weeks with typhoid fever. For two days her temperature had been normal, and she was convalescing nicely. On the second day of normal temperature she ate some solid food and about two hours later began to complain of great pain on the left side of her abdomen

low down--in fact, in the inguinal region. She had two attacks of vomiting, her temperature began to rise, and her pulse to increase. I saw her 48 hours after she ate the solid food and found her with a temperature of 102°, pulse 116, abdomen much distended and very rigid, tender over its whole surface, though, perhaps, more tender on right side. I promptly diagnosticated typhoid perforation and had her removed to the hospital, where I operated at once and found the appendix distended to the bursting point with pus. This was removed without rupture and abdomen closed without irrigation or drainage. Patient was at once relieved of all symptoms and for several days ran a normal temperature; then she had a rise and for two weeks had a typical typhoid relapse, but recovered perfectly and went home well.

A SATISFACTORY METHOD FOR EASILY OBTAINING MATERIAL FROM SYPHILITIC LESIONS.

By E. R. STITT, medical inspector, United States Navy.

Of the various methods for obtaining material for examination for leprosy bacilli, I have found that recommended by Tschernogabow in Archiv. f. Derm. u. Syph., XXXI, H. 2, to be more satisfactory than any of the usual techniques. Of course there is no method that can equal that of excising a small piece of tissue and examining thin sections of such tissue; but the factors of time required in the preparation of the material and the difficulties presenting from the side of the microtome make it difficult of application.

It will be remembered that the leprosy bacilli are found in the corium, or extending downward beneath the skin; their development does not occur in the layers of the epidermis. With this location of the bacilli in mind, Tschernogabow recommended the introduction, through the epidermis and into the granulomatous tissue of the corium, of small capillary pipettes made by drawing out a piece of soft glass tubing. By drawing out the capillary portion of a capillary pipette, such as is used in Wright's opsonic work, and then gently tapping the drawn-out portion against a hardwood surface we obtain a tubelike blood sticker which gives very little pain when penetrating the skin. Of course, the anesthesia of the leprous lesions makes this an unimportant consideration. Penetrating the epidermal structures one can stab in various directions into the subepithelial tissues. In this way we start a flow of serum charged with leprosy bacilli. One can use the rubber bulb of the opsonic pipette to draw up the serum as it exudes from the puncture wound. It is equally satisfactory, however, to wipe away the first drop or two of blood and then by squeezing the leprous tubercle to touch the

exuding drop of serum with a slide and after making a smear preparation to stain it.

In taking material for examination as to the presence of *Treponema pallidum* I have found that unless I thoroughly scraped away the epidermal layers with a curette or similar instrument, and obtained material from the cell proliferations around the arteries deep down in the corium, I did not meet with much success in obtaining the spirochaetes of syphilis.

Not only is this curetting painful, but it makes a wound which is more or less objectionable to the patient.

As the location of the organisms in the cutaneous structures was more or less similar for the chancre and a leproma, it occurred to me to utilize Tschernogabow's method in the examination of chancre-like lesions. Very little pain attends the introduction of the capillary tube sticker and the subsequent puncturing of the granulomatous tissues of the deeper layers of the chancre. There is only the one puncture wound in the epidermis and an intact covering is left instead of the raw oozing surface following superficial scraping.

By squeezing the indurated tissues we obtain small drops of serum. It is very convenient to take up this material with a wooden toothpick and emulsify it into a small drop of salt solution for the preparation to be examined with dark field illumination.

For the India-ink method I take up a small amount of the ink with a toothpick and deposit it near the end of a very clean glass slide. Then with a second toothpick I take up an equal portion of serum, quickly emulsify it in the India-ink, and draw out a film with a second slide according to the blood-smear method recommended by Daniels. Of course, if one so desires, preparations for staining by Giemsa's method, or otherwise, may be made.

As the spirochaetes of yaws are located in the region of the interpapillary pegs of the epidermal layer, the method would not be so applicable as where the organisms proliferate in the deeper structures.

AN EPIDEMIC OF MEASLES AND MUMPS IN GUAM.

By C. P. Kindleberger, surgeon, United States Navy.

MEASLES.

From careful inquiry it has been determined that measles, locally known as *sarampión*, the Spanish name for this disease, was introduced into Guam in 1861 and 1888. The first epidemic, a severe one, began shortly after the arrival of a trading schooner and caused a number of deaths of adults and children. The second epidemic was traced to cases of this disease brought from Manila on a Spanish

steamer. It was much milder than the first and responsible for only a few deaths among the children.

On May 13, 1913, the small daughter of an officer living in Agaña was found to have measles. Investigation revealed the fact that a number of natives in Agaña were sick with this disease. Infection was traced to a native stevedore, who developed measles about April 23, 1913, and was probably infected on April 5, 1913, while unloading the United States Army Transport *Thomas*.

The disease soon became epidemic and spread to all parts of the island, attacking practically all nonimmunes. A daily house-to-house inspection of Agaña and the smaller towns was at once begun and all cases were quarantined in their houses. Enlisted men were isolated and treated in tents on the hospital grounds. The public schools and Sunday schools were closed and no cock fights, *novenas*, or other public gatherings permitted. The people were told to go to their ranches, if possible, and the churches were allowed to keep open with restricted attendance, i. e., no children and no adults from infected houses.

On September 18, 1913, the unrestricted opening of the public schools was recommended, and on September 28, 1913, the last two known cases of measles developed in Agaña. Of the 1,172 houses of Agaña, 718 became infected; no accurate count of the infected houses was made in the smaller towns.

The disease, fortunately, was mild in type, causing comparatively few serious complications and only 43 known deaths. Many natives were unfortunate enough to have measles and mumps at the same time. Table A, at the end of the article, gives in detail the complications seen, and Table B the known deaths. During the epidemic 73 deaths of adults and children classed as due to unknown causes occurred in Sumay, Agat, Merizo, and Ynarajan. Sixteen of these individuals are known to have had measles, but as none of them were seen before their death or examined post mortem by a medical officer it is impossible to determine whether or not this disease was directly or indirectly the cause of death, and therefore these deaths are not included in Table B.

The routine treatment adopted was as follows: Rest in bed and isolation in a dark room, on liquid diet, until subsidence of fever and conjunctivitis; 10 per cent solution of argyrol in eyes b. i. d., to relieve inflammation; mist. glyc. comp. et ammonii chlor. t. i. d., for bronchitis; the skin was anointed p. r. n. with carbolized vaseline and the bowels kept active. The appearance of the eruption was frequently hastened by a hot bath and hot drinks; bathing with cold water was not allowed until after the disappearance of the rash. Each case was isolated for 15 to 21 days and infected houses were kept in quarantine until all cases had recovered. When well the

patient was given a cleansing bath, infected clothes and utensils were washed with soap and boiling water, and the floor of the house thoroughly scrubbed.

Including children of officers, white enlisted men, and all natives, 6,884 cases of measles occurred at this station during the epidemic. On November 25, 1913, the general physical examination of the inhabitants of Guam, which had been in progress since August 4, 1913, was completed by the medical officers on duty at this station. This examination was undertaken for the purpose of obtaining accurate statistics concerning measles and mumps, to discover new cases of gangosa and leprosy, all cases of pulmonary and other forms of tuberculosis, and to verify the population. By actual count the native population was found to be 12,274 on November 1, 1913. Subtracting 46 absentees from the above total population and 4 white cases from the measles total, we find that 56.23 per cent of the natives actually on the island developed measles and that the known deaths from this disease were only 0.625 of 1 per cent.

MUMPS.

From the testimony of several of the oldest and most intelligent inhabitants of Guam, one nearly 90 years of age, it is believed that mumps was unknown on this island prior to the commencement of the recent epidemic. This statement is further substantiated by the fact that there is no regular word for mumps in the Chamorro language. The word *buchi* used by the natives to describe this disease really means enlarged tubercular cervical glands or any swelling on the front of the neck in human beings or animals; the Spanish word for mumps is *parótidas*.

On November 26, 1912, one marine officer, 52 marines, and three civilians arrived at Guam on the United States Army transport *Sherman*. These new arrivals were quarantined on Cabras Island for three days on account of the development of a case of smallpox on that transport 12 days before her arrival in Guam. On December 19 and 21, 1912, two marines from the above draft were admitted to the hospital with mumps. A daily examination of the rest of this draft was at once begun and continued for 15 days, and no further cases developed.

On January 15, 1913, two native enlisted men, doing duty in one of the steam launches at Piti, were admitted to the sick list, with double mumps. These natives were either infected by marines from the above-mentioned draft or by contact with apparently noninfected first and second class passengers, who were allowed to land from United States Army Transport *Thomas*. This latter transport arrived at Guam December 27, 1912, with 19 cases of mumps from the troop deck, isolated in the ship's hospital.

By the end of January mumps had become epidemic in all parts of the island, attacking young and old. No daily house-to-house inspection, isolation of cases, and quarantine of infected houses was attempted for this disease, as the measles epidemic was in progress at the same time, and all the efforts of the medical personnel were directed toward the control and eradication of this more serious disease. Enlisted men with mumps were quarantined in tents on the hospital grounds or in their own homes.

The extent of the mumps epidemic was not known until the completion of the physical examination of the inhabitants of Guam, previously referred to.

The treatment of mumps has been entirely symptomatic; in fact, few cases have required any treatment. There have been no deaths directly or indirectly attributable to this disease, and the only complications seen were one parotid abscess in a poorly nourished child and four cases of unilateral orchitis in adults.

On December 4, 1913, the last known cases of mumps developed in Agaña, and the epidemic is now believed to be over. However, as there are still a number of people who have not had this disease, we may logically expect the development of sporadic cases of mumps for several months to come.

To date, including one officer and four white enlisted men, 6,320 cases of mumps have been recorded.

Leaving out of our calculations the natives who are away from the island, but included in the total native population of November 1, 1913, we find that 51.59 per cent have already had mumps.

TABLE A.

Alphabetical list of complications noted in 102 adults and 31 children during epidemic of measles in Guam.

Abscess of eye (and annexa)	1
Bronchitis, acute, and pneumonia, broncho-	9
Colitis, acute and marasmus	1
Enterocolitis	1
Malnutrition	2
Marasmus	3
Otitis media, acute	1
Petechiae (102 adults and 4 children)	106
Pneumonia, broncho-	2
Pneumonia, broncho-, and nephritis, acute	2
Pneumonia, broncho-, nephritis, acute, and tuberculous meningitis	1
Tuberculosis, acute, general	2
Tuberculosis, acute pneumonic	1
Tuberculosis (unqualified)	1
Total	133

TABLE B.

Alphabetical list of complicating diseases causing 43 deaths (1 adult and 42 children) during measles epidemic in Guam.

Bronchitis, acute	1
Cirrhosis of liver, atrophic and dilation, acute cardiac	1
Complications of measles	5
Enterocolitis	15
Gastroenteritis	2
Gastroenteritis and marasmus	1
Marasmus	3
Nephritis, acute	1
Nephritis, acute, and suppression of urine	1
Pneumonia, broncho	4
Pneumonia, broncho, marasmus, and intestinal parasites	1
Pneumonia, broncho, nephritis, acute, and tuberculosis, acute general	1
Pneumonia, lobar	1
Suppression of urine	1
Tuberculosis, acute broncho-pneumonic	2
Tuberculosis, acute general	2
Tuberculosis, acute pneumonic	1
Total	43

Oldest child, 17 years.
Youngest child, 2 months.

THE FEEBLE-MINDED FROM A MILITARY STANDPOINT.

Suggested examination for their early detection.

By A. R. Schier, acting assistant surgeon, United States Navy.

With the enactment of laws which provide for the health of employees and protect and compensate them when injured, transportation companies and other large corporations have become particular in regard to the physical condition of the men they employ. Recently they are also awakening to a realization of the fact that among their applicants for employment there are not a few "mental irresponsibles." Because of the greater burdens imposed on the employer by the liability laws and from the standpoint of service efficiency, it is becoming evident that a plan is needed to detect the mentally unfit so as to prevent their employment. That the highest degree of safety and efficiency can be obtained only by having mentally as well as physically sound employees is self-evident. The problem, therefore, of detecting mental defects in prospective employees is being made the subject of much thought and study by the medical profession and psychologists. From a military-naval standpoint this problem is no

less important and presents an interesting and fertile field of study for the medical officer. A discussion of a certain group of mental defectives, most likely to be encountered among applicants for enlistment, may therefore be of interest. The writer also wishes to suggest for further trial a series of mental tests which will aid the examiner in differentiating the normal individual from this type of defective.

Among physicians, who have not had special experience with the feeble-minded, there exists a great dearth of information concerning certain degrees and types of mental deficiency. This lack of familiarity with such types leads to much misunderstanding and unfortunately to unfavorable criticisms of students of mental defects. For example, it is not infrequently said that such students see feeble-mindedness in the faces of all they meet. Such criticism results from the fact that a certain group of higher feeble-minded does not come within the preconceived notion of many of what a feeble-minded person is. To them feeble-mindedness is synonymous only with idiocy and imbecility. The largest group of feebleminded at large, however, are not idiots or imbeciles—they being usually cared for in institutions—but those near the border line of deficiency. The defect in them is extremely difficult to detect and they are ordinarily considered to be of normal mentality. It is such cases as these that the medical officer is called upon to detect at the recruiting office, and if not recognized there, later after enlistment.

In the general population there is a group of individuals who are more or less self-supporting at some form of unskilled labor and who under the most favorable circumstances are capable of earning a living. They may acquire more or less education and some even technical training. To the ordinary observer they appear bright enough to pass muster as normal. It is especially significant of this class, however, that they tire easily of one kind of occupation and are constantly drifting from one place to another, many finally becoming vagabonds and tramps. To maintain sustained effort and continuity of purpose is impossible for them. They do not seem to fit into the social and economic scheme of things. If they were under observation for some time it would be found that they lack judgment and self-control and have weak and unstable wills. Such individuals are not capable of competing on equal terms with their normal associates, nor can they manage their affairs with ordinary prudence, due to a mental defect from birth or an early age. They are real cases of feeble-mindedness differing only in degree from the more obvious types. While they can be trained to do a great many things they can never be made normal and require constant supervision and direction. They are truly mental misfits, because they

are not in possession of the higher faculties, by the exercise of which the normal individual adjusts himself to the requirements of life.

Not only are they deficient in mind, but from a moral standpoint they are inferior. Many of the moral deviates or perverts belong to this group. Some of them drift into a more or less precarious method of making a living and because of their susceptibility to criminal influences finally become delinquents and criminals. It has been found by actual tests that 60 per cent of the inmates of some State reformatories belong to this class.

Physically many such individuals are perfect specimens, their development corresponding to their actual ages. Psychological tests, however, show that they have a mentality comparable to that of normal children from 8–12 years. They have reached a distinct level of mental development—a static state—without power of further development, and are doomed to a lifelong childhood. Could they go through life under such close observation and friendly encouragement as the 12-year-old child receives, they would get along very well. To the uninformed, however, they are expected to be dependable individuals, and their shortcomings are not condoned. This results in much grief to them and almost unbearable annoyance to those compelled to work and associate with them.

That such individuals can not adapt themselves to military life is certain. Such ideas as duty, obedience, truthfulness, and patriotism are entirely foreign to them. They tire early of instruction and can not adjust themselves to the changed conditions of the service. If left to carry out instructions or called on to think for themselves, their lack of dependability becomes manifest. When brought in contact with normal associates they soon feel their incompetence and become discontented and discouraged, which, added to their lack of stability, leads to desertion from the service. Others may resort to the misuse of alcohol, and while under its influence commit various offenses for which they are punished. Again, others become very irritable and at times develop periods of excitement, and finally definite psychoses.

From an experience among the military offenders confined at the Naval Disciplinary Barracks, at Port Royal, S. C., Passed Asst. Surg. Mann, United States Navy, concludes that from 3 to 10 per cent of the culprits there should be treated solely by alienists. Some one versed in psychiatric diagnosis, he believes, would perhaps materially enlarge this number. Further, that in from 10 to 30 per cent the assistance of either the physician or alienist would greatly aid the penologist in his efforts to reform these culprits. The assumption that a large number of those classed as mentally defective by Mann belongs to this type of feeble-minded is in accord with the results

obtained by testing the mentality of offenders confined in similar civil reformatories. Only recently the inmates of the Iowa State Reformatory were examined mentally by the Binet-Simon scale. Of the 311 inmates—whose ages were from 16 to 49 years—examined, 138 were found to have a mental age of 11 years and 27 of 9 years, making a total of 165 who properly belonged in this class of defectives.

An investigation into the mental status of deserters, especially among recruits, might reveal defective mentality in not a few of these offenders and might show that some belong to this type of defectives. As instability, suggestibility, and weakness of will power characterize this group of subnormals, and, as conduct is dependent largely on a will capable of controlling action and emotion, they are very prone when dissatisfied or when it is suggested by others, to desert from the service. The though that there is something lacking in the mental make-up of this class of offenders has occurred to line officers. For example, the executive officer of one of the Marine Corps recruit depots recently expressed the opinion that desertions among recruits—which are most frequent between the fifth and sixth week of instruction—are due principally to lack of stamina or shiftlessness in the recruit. Those eloping en route to the recruit depots, he believed, are principally tramps. Studies of the tramp fraternity have shown that the majority of its members is feeble-minded. One recruiting district reports that 90 per cent of its desertions were from the transients enlisted, and as tramps are of course among the transients, this may be of some significance. To assert that all deserters and elopers are feeble-minded would be absurd, but a study of the mentality of these culprits might disclose mental feebleness in some of their number and might justify the thought that a material reduction in the number of such offenders will follow the elimination of the high-grade feeble-minded from the service.

Viewed from a military standpoint the study of this class of mental subnormals is interesting for another important reason. The belief pretty generally prevails that such defectives are immune to insanity. It is not uncommon, however, for them to develop psychoses with hallucinations and delusions. Of the psychoneuroses occurring in the service, neurasthenia and psychasthenia are the most frequent. Dr. Chas. L. Dana estimates that 50 per cent of the cases of hysteria, psychasthenia, neurasthenia, and also of mild recurrent melancholia, occur in persons who have not a strong intelligence—that is, are not constitutionally smart. His estimate was confirmed by the use of the Binet-Simon scale in the psychasthenics. He says:

According to this scale, if a child tests up to or about the age of 12, he is normal and does not require custodial care; he goes out into the world and tries, at least, to make a way for himself. If a woman, she may marry. If a

man, he may undertake an art, a craft, a business, or a profession. These people, perhaps, have no moral instability and do not become criminals, but yet, being really retarded, instead of filling the ranks of criminals and the work-house population, they fill the offices of neurologists with their sufferings and complaints. The study of retardation therefore among psychoneuroses furnishes a rich field for further investigation.

In view of this opinion it would be interesting to know if some of the cases occurring in the service might not have shown mental feebleness at the time of enlistment.

The diagnosis of this degree of mental defect at the time of enlistment is, it is needless to say, extremely difficult. Certain it is, that it can not be detected by a casual inspection and a reading and writing test. To meet with any degree of success the examining officer needs a system of examination which will test the various mental functions, especially the power of attention, good sense, judgment, capacity to initiate, and adaptability. On the recognition of such points the diagnosis of a normal mind must rest. Such a scheme of examination should be standardized so that it can be given by different men and yet obtain fairly constant results by eliminating any serious personal equation. With a view of devising such a scheme the writer has been trying many mental tests. Also, through the kindness of Dr. Geo. Mogridge, of the Iowa Institution for the Feeble-Minded, it was made possible to try many tests on the higher grade feeble-minded at this institution. As a result of this work a group of tests, believed to be suited for recruiting examinations, was selected and is submitted for further trial. This scheme of examination is not intended to bring out every form of mental defect, but an experience with it so far has shown that it will be a valuable aid in diagnosing the high grade feeble-minded, whose deficiency would otherwise be recognized only after weeks of observation at the training stations. Its advantage over a haphazard method of judging an individual's mentality will become apparent if given a fair trial. Before applying the tests the examiner should thoroughly understand the purpose of each one. They are very simple and are easily given. It is their simplicity which may cause some to doubt their value, yet each one determines some phase of mental capacity. All applicants to whom they have been applied have been eager to pass them successfully. This is of decided advantage and adds to their value, inasmuch as they test to the fullest extent an applicant's mental capacity. It is also in favorable contrast to the use of such tests on criminals, who, being wary and suspicious, are inclined to show indifference as to their results. The examination should be conducted in a quiet room to avoid any distraction. The applicant should be urged to do his best, and never should any replies be criticized. The family and personal history should be inquired into before beginning with the tests proper. The applicant should be questioned in reference to the num-

ber of years and the kind of schools he has attended: whether he has ever been an inmate of a State institution, and what his present and previous occupations have been, so as to learn how frequently he has changed from one kind of work to another. The results of each test are scored—as shown in the accompanying specimen record form—the successes being marked by a plus sign and the failures by a minus sign. The tests are given in the order as follows:

1. Repetition of seven numerals.

   Have applicant repeat:

   (*a*) 6—4—1—3—7—9—5.
   (*b*) 8—2—5—7—3—6—9.
   (*c*) 3—7—2—5—8—4—6.

   One correct repetition passes test. Changes in order are not counted as errors.

2. Drawing a design from memory.

   Show applicant card with designs (Fig. 1) for 10 seconds, and have him draw from memory what he has seen.

   One design drawn correctly and other about half correctly passes test.

3. Sentence building (Masselon).

   Have applicant write sentence, using the following words: "Station," "train," "conductor."

   Passed if he writes either one sentence expressing one idea, or two sentences expressing two separate ideas.

4. Computation (orally).

   Add:

   (1) (*a*) 73 and 22.
   (*b*) 90 and 18.
   (*c*) 84 and 25.

   Subtract:

   (2) (*a*) 7 from 63.
   (*b*) 24 from 87.
   (*c*) 20 from 96.

   Multiply:

   (3) (*a*) 7×9.
   (*b*) 6×8.
   (*c*) 7×4.

   Passed if six answers are correct out of nine.

5. Form board puzzle (Healy).

   Prepare form board shown in figure 2. Inside dimensions of frame 3×4 inches. Blocks to be as follows: $1\frac{1}{4} \times 3$, $1 \times 1\frac{1}{2}$, $1 \times 2\frac{3}{4}$, $1 \times 1\frac{1}{2}$, $1\frac{1}{4} \times 2$.

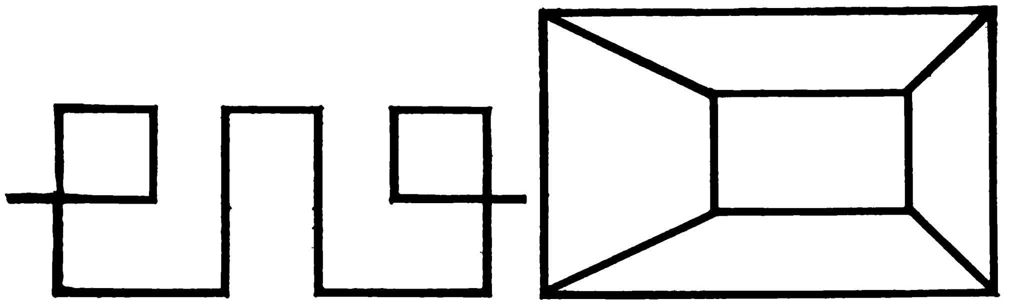


FIG-1

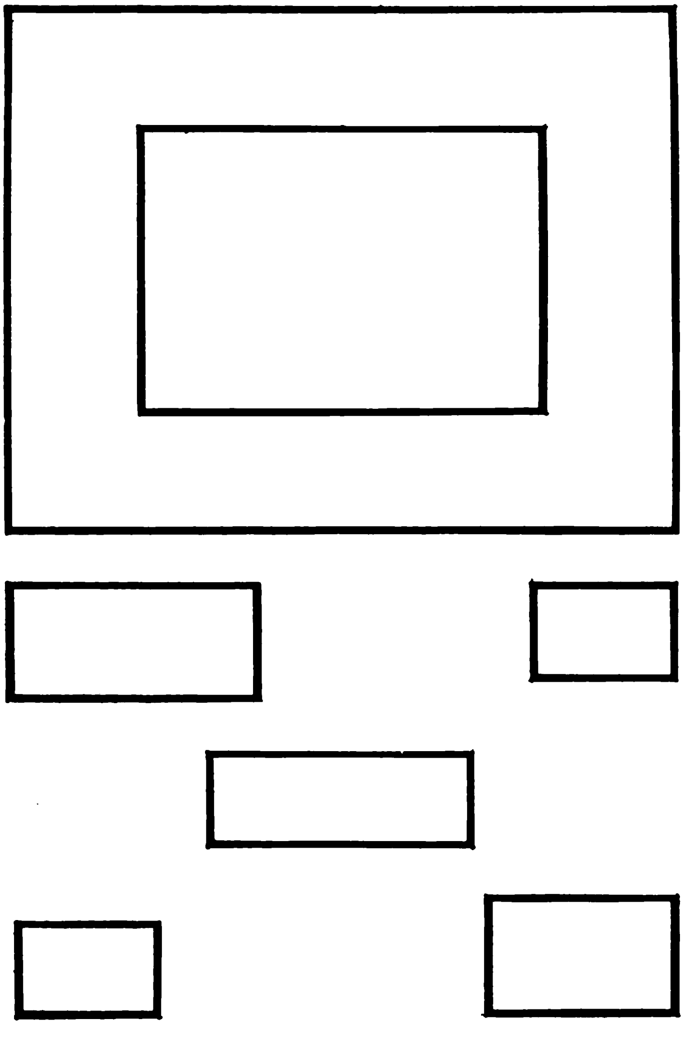


FIG-2

Explain that blocks, if put in correctly, will fit and exactly fill frame. Ask applicant to put them in correctly as fast as he can.

Passed if he succeeds in 55 seconds or less. Give second trial if he succeeds, in order to determine if first success was accidental.

6. Definition of abstract words.

Ask applicant—

(*a*) What is charity?
(*b*) What is justice?
(*c*) What is bravery?
(*d*) What is revenge?
(*e*) What is kindness?

Passed if he gives three satisfactory definitions out of five. Object is only to determine whether abstract meanings are comprehended.

7. Recognition of absurdity in absurd statements.

Tell applicant you will read him sentences in which there is nonsense, and for him to tell you where it is. Read a second time, if he does not respond readily.

(*a*) "A bicycle rider, being thrown from his bicycle in an accident, struck his head against a stone and was killed. They took him to the hospital, but they do not think he will get well again."
(*b*) " I have three brothers, Paul, Ernest, and myself."
(*c*) " The police found yesterday the body of a young girl cut into 18 pieces. They believe that she killed herself."
(*d*) " Someone said, 'If in a moment of despair I should commit suicide, I should not choose Friday, because Friday is an unlucky day, and it would bring me ill luck.' "

Passed if there is only one failure out of the four trials.

8. Problems of diverse facts:

Ask applicant to finish sentence as it should be.

(*a*) " A man out walking in the park suddenly stopped, much frightened, and then ran to the nearest policeman, and told that he had seen hanging from the limb of a tree a ——— [after a pause] a what? "
(*b*) " My neighbor has been having strange visitors. He has received one after the other a physician, a lawyer, and a minister. What has happened at the house of my neighbor? "

Passed if both are answered intelligently.

9. Reading and report.

Have applicant read aloud the following story, and then give the point of it in his own words:

Cowboy story. "A cowboy from Arizona went to San Francisco with his dog, which he left at a dealer's while he purchased a new suit of clothes. Dressed finely, he went to the dog, whistled to him, called him by name, and patted him. The dog would have nothing to do with him in his new hat and coat, but gave a mournful howl. Coaxing was of no effect, so the cowboy went away and donned his old garments, whereupon the dog immediately showed his wild joy on seeing his master, as he thought he ought to be."

10. Telling time if hands of clock were interchanged:

Say to applicant—

(*a*) "If at 6.22 the hands of a clock were interchanged, so that the small hand would be where the big hand is, and the big hand would be where the small hand was, what time would the clock then show?"

(*b*) Repeat same for 2.46 o'clock.

Passed if both answered correctly, allowing liberal time. No watch, clock, or drawing must be used.

These tests, as stated, are those selected after the trial of many such tests during the past year, including the Binet tests, a report of which was published in the United States Naval Medical Bulletin, July, 1913. Later these and other tests were tried on a group of high-grade feeble-minded and on a like number of normal individuals. The object of these trials was first to select such tests as would be especially suited for the class of individuals who are applicants for enlistment, and second to determine the minimum number of such a series of tests to be successfully passed to differentiate the mentally fit from the feeble-minded applicant, and yet do no one any injustice. The feeble-minded to whom these tests were applied were inmates of the Iowa Institution for Feeble-Minded. They were all males, whose ages ranged from 19 to 34 years—to correspond to the ages of applicants—and were the brightest, most capable at the institution. To the casual observer 95 per cent of them would appear to be of normal mentality. Among the number were several who played in the institution band and orchestra, others worked as carpenters, painters, teamsters, and farm hands. Their residence at the institution varied from several months to a number of years, and the diagnosis of feeble-mindedness had therefore been confirmed by such long periods of observation. They all belonged to the type referred to in this article.

In order that the nature and purpose of these tests may be better understood a brief explanation of each will be given.

Test 1. Immediate auditory memory is tested by the repetition of numerals. This is difficult for the feeble-minded. Imbeciles fail to repeat more than four numerals, while imbeciles who have remarkable memories for dates, passages in books, etc., show complete failure in memory for numerals. Of all the failures scored by the feeble-minded on the entire series 10.6 per cent were on this test.

Test 2. A test of immediate visual memory. For the feeble-minded this test was not difficult, and it was second in number of successes scored by them. Failures on it were 5.3 per cent.

Test 3.—Masselon or sentence-building test. It was included in this series, not only to test the applicant's ability to write, but to build a sentence of good sense. About one-third of all the 9-year-old children and one-half at 10 years are able to pass this test. Of the entire series this was the easiest test for the feeble-minded, which demonstrates the unreliability of using a writing test alone as an index to mentality. Failures on it were only 4.5 per cent.

Test 4.—Computation (oral) tests attention, retention, and simple associative activity. For the feeble-minded the average performance was found less and the variability greater than in normal individuals. Failures on it were 10.6 per cent of all for the series.

Test 5.—This is a so-called performance test, which brings out perception of relationship of form and also an individual's method of mental procedure for the given task, particularly his ability to profit by the experience of repeated trials, in contradistinction to the peculiar repetition of impossibilities, characteristic of the subnormal and feeble-minded groups. (Healy.) The failures scored on this test by the feeble-minded were 8.3 per cent of all failures.

Test 6.—The definition of abstract words is a test of the degree of mental development and the grade of intelligence. That this was difficult for the feeble-minded is shown by the number of failures on it, which were 11.3 per cent of all for the series.

Test 7.—Alienists use tests similar to this one to learn if a patient will assent to ridiculous assertions. This test requires the applicant to detect and explain the absurdity. The feeble-minded found this test difficult; 12.8 per cent of all failures were on it.

Test 8.—This is a so-called judgment or common-sense test. As was to be expected, it was very difficult for the feeble-minded. It was second in the number of failures scored, and is represented by 14.3 per cent of all the failures for the series.

Test 9.—Included in the series, not only to test an applicant's ability to read, but to understand and report what he has read. This test was not difficult for the feeble-minded, failures on it being 6 per cent of all. The unreliability of a reading test alone as a test of

mentality is satisfactorily shown by the number of successes scored on this test by the feeble-minded.

Test 10.—Active attention, visual imagination, and simple reasoning are demanded of the applicant by this test. It is the most difficult of the series, only the most capable succeeding on it. The failures scored on this test by the feeble-minded were 15.9 per cent of the total number.

In the following table are shown the percentages of successes scored on each test by three groups—the normals, the feeble-minded, and those applicants for enlistment who failed on more than three tests, including two deserters, who were examined.

Test No.	Normals.	Feeble-minded.	Applicants, deserters.
	Per cent.	*Per cent.*	*Per cent.*
1	96	44	100
2	84	72	33
3	100	76	33
4	80	44	66
5	86	56	66
6	92	40	66
7	92	32	33
8	80	24	33
9	100	68	66
10	68	16	4
Total	878	472	500
Average number of tests passed	8.78	4.72	5

As will be noted, the average number of tests of the series successfully passed by the normals was 8.78, whereas the feeble-minded succeeded on only 4.72, and the applicants classed as mentally unfit, and two deserters on only 5. None of the normals passed less than seven tests.

Based on these results, obtained after numerous and repeated trials, the conclusion was reached that for the purpose of differentiating the applicant of normal mentality from the one mentally unfitted for the service, a minimum of seven tests should be successfully passed. This investigation has also shown that such a requirement will eliminate 90 per cent of the feeble-minded. With these conclusions Dr. L. T. Sidwell, psychologist of the Iowa Institution for Feeble-Minded, who, together with the writer, applied these tests, agrees.

It may occur to some that the group of feeble-minded to whom these tests were applied, being institution inmates, were therefore markedly deficient, which would make valueless the comparative results. However, as mentioned before, the brightest, highest types were chosen for this purpose. Their ages and occupations corresponded as nearly as was possible with those of applicants for enlistment. As regards physical make-up, appearance, and behavior 95 per cent of them would pass as normal. It is just such cases that are met with among applicants for enlistment. The writer personally

knew several such former institution inmates who eloped and were accepted for enlistment in the various branches of the military service. How long they remained in the service is not known, but they certainly passed as normal individuals. Only a few weeks ago one of two brothers who were inmates of the Iowa institution and who were among those given these tests, was brought in for examination, having applied for enlistment. He was recognized and rejected. He told of having run away from the institution, and after wandering about for several weeks, working at various kinds of jobs, finally decided he would enlist. Although rejected at this station he applied at the recruiting station of another service where he was accepted and sent to the barracks. This was learned later. This young man to all appearances was normal, yet he could pass only four of these tests. He may do well in the military service for a time, but this is very doubtful.

Perhaps such a standard may seem rather an arbitrary one to fix. However, when the purpose of this scheme of examination is borne in mind, namely, the differentiation of the mentally fit from the feeble-minded applicant under circumstances far from favorable from a diagnostic standpoint, and in a brief time the need of such a standard will be granted. The examiner has no such aids as a long period of observation, supplemented by a complete and reliable previous history, which are unquestionably superior to mental tests alone in accurately diagnosing feeble-mindedness. A decision must be reached by him at once as to an applicant's mental fitness for acceptance into the service. Should his judgment be wrong and a mental weakling be accepted, the efficiency of the service will be impaired by such an addition, or possibly a future candidate for a naval prison or hospital for the insane has been added. Some, it is true, are recognized later, but not until an expense has been incurred for which no returns are received. Therefore, the necessity of having a definite standard, a dividing line, which will permit the examiner to determine at once with a reasonable degree of certainty that an applicant is or is not mentally fit for the service.

Those who rely on a sizing-up process and a few desultory questions to judge mentality by will have the unreliability of such a method pointed out by the use of mental tests. A reading and writing test alone is of no value as an index of normal mentality. The writer has had many interesting and surprising results from the use of these tests on applicants for enlistment. As few as three of the tests have been passed—of which two were the reading and writing tests—in spite of an earnest effort made by the applicant, yet such an individual would ordinarily pass as mentally qualified for enlistment. Surely an applicant with only sufficient intelligence to pass three of these tests is not one who should be enlisted.

This suggested scheme of examination is not the final word, and is merely submitted for further trial. An extended experience with it will undoubtedly bring about modifications. It establishes, however, a working basis, which it is hoped may be productive of much good to the service by preventing the enlistment of a certain percentage at least of the mental misfits who might otherwise be accepted.

Since the above article was written, the results obtained by applying a series of mental tests to 100 men confined at the United States Naval disciplinary barracks, Port Royal, S. C., have been reported by Passed Asst. Surg. H. E. Jenkins, United States Navy. The group of tests used by him was a series tentatively selected early in the writer's investigation on this subject. In this tentative scheme were included tests 1, 3, 4, 9, and 10, described in the above article. No definite number to be successfully passed had been determined nor had any method of scoring been devised when they were submitted for trial at the disciplinary barracks. Of the number examined (100), seven failed to pass the tests and were classed as feeble-minded. Had a definite standard been fixed and the proper method of scoring been determined when these men were examined it is believed the percentage of failures would have been higher. The following, quoted from Dr. Jenkins's report, is interesting in this connection:

> It must be remembered that in examining a large body of men at one time the tests are told the others by those examined, who have time to prepare for them. It is believed that this occurred in the present examination and that the percentage of failures would otherwise have been higher. Personally, I am of the opinion from the above observation that this test will eliminate the feeble-minded from a military service if carried out at the recruiting depot.

THE TOWNE-LAMBERT ELIMINATION TREATMENT OF DRUG ADDICTIONS.

By W. M. Kerr, passed assistant surgeon, United States Navy.

One day during the latter part of 1906 there came to the alcoholic ward of Bellevue Hospital in New York City a man named Towne, who claimed to have developed a treatment for alcoholism and other drug addictions, by means of which the habitué could be relieved of all longing for alcohol or other drug in about four or five days. He was a layman, the proprietor of a sanatorium in New York, and he requested that he be allowed to take a certain number of alcoholics from the hospital to his institution to treat them free of charge as a demonstration of the effectiveness of his treatment. To the internes of Bellevue who had had experience in the treatment of the alcoholic riffraff of New York, Mr. Towne's claim was past belief. He was eventually referred to some of the visiting physicians, with the result

that he was allowed to pick out a certain number of alcoholics from a few who volunteered to take the treatment. They were returned to the alcoholic ward at the end of the allotted time, a little shaky, it is true, but in much better condition than they would have been after some weeks of the treatment then in vogue in Bellevue Hospital. Repeated demonstrations of the efficiency of the treatment soon convinced the doubters of the house staff that a radical change in the treatment of the drug habitué was to take place. Among the visiting staff, the physician who evinced most interest in the new treatment was Dr. Alexander Lambert, who made a careful study of it, polished off some of the rough edges, and in an article, The Obliteration of the Craving for Narcotics, in the Journal of the American Medical Association, September 25, 1909, published the treatment to the medical profession at large.

All narcotics, if taken over a certain length of time, require an ever-increasing dose to give a desired effect and at last fasten themselves upon their victim as a habit which in some cases can not be put aside by will power alone. Every medical officer has seen at some time the man who at the start of his career takes a cocktail occasionally before dinner and in a few years requires three or four cocktails before lunch, a like amount before dinner, and, perhaps, an "eye-opener" before breakfast to get him through his daily task. Alcohol to him is a drug and he has acquired a drug habit. We all have seen how miserable that man is if by some necessity he is deprived of his drug. The victim of cocaine is appearing with increasing frequency. We see him, utterly unreliable and helpless, ready to go to any extreme to secure his drug. Again, we have seen the unfortunate victim of morphine or opium. The drug, at first, perhaps, legitimately prescribed by a physician to ease some pain, is taken in ever-increasing doses to secure the desired effect until the habit is acquired. The morphine or opium which at first afforded pleasure and a feeling of well-being after a time ceases to do so, but its use is continued because of the suffering experienced by the habitué when it is withdrawn. "In spite of all statements and beliefs to the contrary the habitué can not break away from this drug of his own volition unless some treatment is at hand to relieve the intensity of the withdrawal symptoms, because of the intense suffering which these symptoms bring." In the Towne-Lambert treatment, which fulfills the above requirement, the drug retained in the body tissues of the habitué is rapidly and thoroughly elimated by means of vigorous mercurial catharsis and the withdrawal symptoms are alleviated by the simultaneous administration of a belladonna mixture until marked physiological belladonna effect is secured.

The treatment as outlined by Towne and elaborated by Lambert is one with many details which have to be mastered before it can be

successfully carried out. This required attention to detail is the writer's reason for preparing this article. Although the treatment has recently been reviewed by Lambert—The Treatment of Narcotic Addiction—in The Journal of the American Medical Association, June 21, 1913, its details may soon become hazy in the minds of most of us. In order that they may be preserved where they may be readily reached by medical officers in an emergency, the various procedures are fully set forth, with the report of a case of morphin intoxication and one of alcoholism as illustrations.

Just as there is one best way to stoke a fire or one best way to fire a gun, so there is one best way to treat drug addictions, and that is believed by the writer to be along the lines laid down by Towne and Lambert. The treatment described by them is not a cure of the drug habit. It, however, will obliterate the terrible craving these patients suffer when, unaided, they try to get along without their drugs. The old method of treatment was by either slow deprivation or rapid deprivation of the drug. The new method is by elimination. Deprivation causes intense suffering while elimination relieves it. The writer well remembers the agony of a poor woman, a patient in the New York City Hospital, whom he deprived of morphin in a vain endeavor to free her of the morphin habit. Her screams caused by pain in her limbs could be heard throughout the hospital. Her sufferings were intense, and her case was in marked contrast to that of the young woman outlined below. The physician can eliminate and so free a patient from the drug and his desire for it; but he can not regenerate him or prevent him from repoisoning himself by taking again the drug which led him on to his habitual intoxication. No person relieved of his craving for drugs by this treatment can ever take again one dose of the drug without the danger of again acquiring the drug habit. So the treatment of the convalescence becomes of a psychological nature, and one must endeavor to instil into the mind of the patient the necessity of changing his former habits of life, environment, and thought. As Lambert says:

> The quickest method to bring these patients back to health is to send them to some physical trainer in order that their bodies may be put in as perfect condition as their years and the state of their viscera permit. To mollycoddle them and treat them as neurasthenic invalids means simply to increase the liability of their relapse, but to build them up bodily will do more to build them up mentally for the first three to six weeks than any other method of procedure.

The absolute essentials of the treatment which can not be altered are:

A. The removal of the patient to a hospital or sanatorium where the medical attention can be constant; where the patient will exert

more self-control than in his own home; and where the supply of narcotic can be controlled. The treatment can not be successfully carried out in the patient's own home, for there the habitué will do as he pleases and not as the physician desires he shall do.

B. The persistent administration of a belladonna mixture in small doses at frequent intervals. The composition of this mixture is as follows:

℞	c. c.
Tincturæ belladonnæ (15 per cent)	62
Fluidextracti xanthoxyli.	
Fluidextracti hyoscyami, a. a	31

A 15 per cent tincture of belladonna must be used or an equivalent amount administered if a weaker tincture is employed. "If this is not done the craving for the drug is apt to remain as a nagging longing, and the obliteration of the craving is incomplete." The belladonna mixture is to be pushed to the beginning physiological tolerance of the belladonna, as shown by dry tongue and throat, dilated pupils, or even a flushing of the skin or a rash. Unless this is done the desired results are not obtained. This belladonna mixture must be given in small doses every hour, day and night.

C. The thorough elimination of the drug from the body tissues by means of some form of mercury as a cathartic. This practically means blue mass or calomel, either given in some form of compound cathartic pill or alone. Some patients who are salivated by small doses of calomel can take blue mass. The cholagogue action is essential and must be continued until there is a free outpouring of bile. The mere clearing out of the intestinal tract is not sufficient to eliminate the drug from the body tissues. Enemas given to clear out the colon do not produce the same effect as cathartics. There must be the cholagogue action from above. Often calomel in divided doses can be advantageously substituted for the compound cathartic pills, especially if the patient is nauseated. To get the desired effect, the compound cathartic pills must be freshly prepared, preferably with a glycerin and water excipient, otherwise they may not dissolve and will be passed intact through the intestines. Often if the cholagogue action is not secured, and the stools about the fortieth hour of treatment become clay-colored, some form of ox-gall should be employed.

D. It is absolutely essential that the morphin patient when starting the treatment should have a thorough cathartic action before the belladonna administration is begun. If this cathartic action is not secured the patient is sure later to be troubled with persistent vomiting.

E. In the treatment of the morphin patient, three-fourths of the habitual total 24-hour dose must be given as the initial dose of morphin. The patient then goes through his first two periods without

distress, and he does not begin to have the symptoms of discomfort until the third dose of morphin begins to wear off. If too little morphin is given in the beginning dose and one halves it at the second dose and decreases it again at the third dose, owing to the insufficiency in the beginning the patient is not really comfortable at any time and has a nagging desire for more.

Morphine, opium, or heroin.—The patient is given 5 compound cathartic pills and 5 grains of blue mass. Six hours later, if these have not acted well, they are followed by a saline. After three or four large bowel movements from these cathartics the patient is put to bed and is given, in his habitual way, by mouth or by hypodermic, in three divided doses at half-hour intervals, three-fourths of his accustomed daily 24-hour dose of morphine (or opium). Six drops of the belladonna mixture are given in capsules at the same time as the morphine. The drops are dropped from a medicine dropper, consequently each drop represents about one-half minim of the mixture. The belladonna mixture in doses of 6 drops is given every hour for six hours, at the end of which time the dosage is increased 2 drops. This belladonna mixture is continued every hour of the day and of the night continuously throughout the treatment, increasing 2 drops every six hours until 16 drops are taken, when it is continued at this dosage. The mixture is diminished or discontinued at any time if the patient shows severe belladonna symptoms, such as dilated pupils and dry throat with flushed skin, or the beginning of the incisive and insistent voice of belladonna delirium. It is again administered in decreased doses after these symptoms have disappeared. If the patient has an idiosyncracy toward belladonna these symptoms show themselves early, generally in the first six to eight hours, and the hourly dose must be reduced to 2 to 4 drops and raised by 1 drop every six hours. If the patient has a marked tolerance to belladonna and the full dose of 16 drops persisted in for 12 hours does not give dryness of the throat the dosage should be raised to 18 or 20 drops or more until the required effect is secured and then the amount is reduced to a sufficient quantity to keep up the belladonna effect. At the tenth hour after the initial dose of morphine, 5 compound cathartic pills and 5 grains of blue mass are again given. These should act in six or eight hours after they have been taken. If no copious action results by this time, some vigorous saline is given. When the bowels have acted thoroughly the second dose of morphine is given, usually about the eighteenth hour. This dose is one-half of the first or initial dose. The belladonna mixture is still continued. Ten hours after the second dose of morphine, or about the twenty-eighth hour, 5 compound cathartic pills and 5 grains of blue mass are again given and if necessary followed by a saline six or eight hours later. After this cathartic has thoroughly acted, at about the thirty-sixth hour, the

third dose of morphine is given. This dose is one-sixth of the first or initial dose. This is usually the last dose of morphine that is necessary. About this time the heart begins to show the need of stimulation and the patient should be given digitalis or strychnine, or both, every four or six hours as required. Ten hours after the third dose of morphine—that is, about the forty-sixth hour—5 compound cathartic pills and 5 grains of blue mass are again given, followed in seven or eight hours by a saline. Bilious green stools should be the result of this cathartic. When these appear, after the bowels have moved thoroughly, about 18 hours after the third dose of morphine, or about the fifty-sixth hour of treatment, 2 ounces of castor oil are given to clear out thoroughly the intestinal tract. During all this time the belladonna mixture has been given and sometimes it is necessary to continue it over one or two more cathartic periods before giving the oil. The cathartic periods must continue until the green stools appear.

During the interval when the bowels are moving from the last cathartic and before the oil is given the patient has his most uncomfortable time. He is apt to be extremely nervous and irritable, and must be handled with firmness until the nervousness can be controlled. It is usually allayed by codein given hypodermically in 5-grain doses and repeated if necessary. Dionin, which Lambert found to be about twice as strong as codein in its power to relieve the nervousness and feeling of distress, is also useful in doses of 2 or 3 grains. These two drugs should be discontinued as soon as possible after the castor oil has acted. They may be given during the following 24 hours if absolutely necessary, but if the patient is for any reason taking codein for 48 hours after he is through his treatment he will persist in doing so and must then be broken from it or he will return again to morphin.

The pains in the joints and aching in the bones and muscles which appear about this time and which are due to the withdrawal of the drug from the system can be relieved sometimes by massage and the application of dry heat, sometimes by the hypodermic injection of fluid extract of ergot, sometimes by a salicylic compound combined with a coal-tar analgesic, as phenacetin, antipyrin, or aspirin. They can always be helped by codein or dionin, but these drugs are to be avoided for the above-mentioned reasons.

With the nervousness and feeling of discomfort and the withdrawal pains alleviated, and after the castor oil has acted, we enter into the period of convalescence. The patient should be carefully nourished and should remain in bed for three or four days, because during the two or three days after he is off his drug any indiscretion in diet or any attempt at too much physical exertion will bring a recurrence of the withdrawal symptoms.

Insomnia is often troublesome after the patient is off his drug. This may be relieved by bromids, chloral, or trional. However, the best hypnotic appears to be muscular fatigue, therefore the patient should begin to exercise regularly and to build up physically as soon as his condition permits, which is usually within a week after he is off his drug.

The report of the case which follows is of value not only because it illustrates the steps of the treatment, but because it shows one of the undesirable symptoms which sometimes complicate the treatment and defeat its purpose, namely, persistent vomiting. It is needless to say that with the stomach emptying itself frequently very little of the medication is retained and consequently the catharsis is insufficient, the required belladonna effect is difficult to obtain, and the treatment is unduly prolonged.

The patient, aged 23, a trained nurse, wife of an enlisted man in the Navy, residing in Honolulu, Hawaii, stated that for the past five years she had been accustomed to take morphine hypodermically during her menstrual periods, and in the intervals when feeling nervous. Early in August, 1913, she suffered from a peritonsillar abscess and, in order to relieve the pain, her attending physician gave her a prescription calling for 6 tubes of one-quarter grain morphine tablets. He advised her to keep herself comfortable. This prescription she had no difficulty in having filled and refilled in Honolulu, and in order to keep herself comfortable she used the drug freely, taking it by hypodermic injections. The abscess was opened under chloroform anesthesia, and from the time of recovery from the anesthetic she had almost constant nausea and frequent vomiting. The nausea and vomiting which appeared to have been induced by the anesthetic may have been aggravated by the excretion of morphine by the gastric mucous membrane. They were in reality symptoms of early pregnancy, the patient having had her last menstruation in August, and becoming pregnant immediately after. However, as a consequence of the foregoing, she soon became in a deplorable condition, intensely miserable and nervous, except when under the influence of morphine, unable to retain anything in the stomach, and losing weight and strength. At the request of her husband, the writer saw her first on October 10, 1913, at which time she confessed taking morphine and begged him to free her of her habit. She was at that time taking 3 grains of morphine sulphate daily by hypodermic, which is not a large daily dose for a habitué. She was removed from her home at Waikiki to the Kawala Street Sanatorium in order that the above-described treatment might be strictly carried out.

The notes of the treatment, somewhat condensed, are as follows:

October 10, 1913, noon. On admission, temperature, 96.6°; pulse,

100; respiration, 24. Very nervous, nauseated, and crying. Physical examination showed no abnormality. Three p. m., calomel, 1 grain, in divided doses; 4 p. m., milk, 2 ounces, lime water one-half ounce; 5 p. m., vomited greenish fluid; 5.30 p. m., beef tea, 4 ounces; 6 p. m., vomited pale-green fluid; 7. p. m., begging for morphine, given morphine sulphate, one-half grain, atropin sulphate one one-hundredth grain by hypo.

October 11, 6 a. m., slept all night; magnesium sulphate, one-half ounce; 8 a. m., slight bowel movement; beef tea, 4 ounces; 12 noon and 2 p. m., vomited pale-green fluid; 3.30 p. m., morphine sulphate one-fourth grain and atropin sulphate one-fiftieth grain by hypo.; 4 and 6 p. m., beef tea, 4 ounces; 8 p. m., albumin water; 9 p. m., vomited; 10 p. m., 5 compound cathartic tablets and 5 grains of blue mass.

October 12, 6 a. m., slept poorly; vomited pale-green fluid twice during the night; magnesium sulphate, one-half ounce; 7.30 a. m., one large semisolid stool followed by two watery stools; 9.45 a. m., morphine sulphate, three-fourths grain by hypo.; 10.15 a. m., morphine dose repeated; 10.45 a. m., morphine dose repeated with 8 drops of belladonna mixture. (No 15 per cent tincture of belladonna could be obtained, and a 10 per cent tincture had to be used.) At 11.45 a. m., 8 drops of belladonna mixture; at noon, 3 ounces custard; vomited shortly after taking custard. All food and liquids were stopped because of vomiting; 12.45 p. m., 8 drops of belladonna mixture, repeated every hour to 3.45 p. m., when it was increased to 12 drops, which dose was repeated every hour to 6.45 p. m., when 5 compound cathartic pills, 5 grains of blue mass, and 12 drops of belladonna mixture were given. At 7.15 p. m. vomited pale-green fluid; has been comfortable up to now; 7.45 p. m., 12 drops of belladonna mixture, calomel, one-tenth grain, every 10 minutes for 12 doses; 8 p. m., vomited a large amount of green fluid; 8.45 p. m., 12 drops of belladonna mixture; 9.30 p. m., vomited; 9.45 p. m., 16 drops of belladonna mixture; vomited; 10.30 p. m., vomited; 10.45 and 11.45 p. m., 16 drops of belladonna mixture; slept at intervals.

October 13, 12.45 a. m., 16 drops of belladonna mixture and magnesium sulphate, one-half ounce; 1.15 a. m., vomited; 1.45 a. m., 16 drops of belladonna mixture; very restless; 2 a. m., large, brown, watery stool; 2.30 a. m., vomited; 2.45 a. m., 16 drops of belladonna mixture, morphine sulphate, 1⅛ grains, by hypo.; 3.45, 4.45, and 5.45 a. m., 20 drops of belladonna mixture; sleeping at intervals; 6 a. m., vomited; 6.45 and 7.45 a. m., 20 drops of belladonna mixture; 7.55 a. m., vomited; 8 a. m., lemonade, 4 ounces; 8.45 a. m., 20 drops of belladonna mixture; 9.30 a. m., vomited; 9.45 a. m., 24 drops of belladonna mixture; 10 a. m., vomited pale-green fluid; 10.45 and 11.45 a. m., 24 drops of belladonna mixture; 12.45 p. m., 5 compound

cathartic pills, 5 grains blue mass, and 24 drops of belladonna mixture; 1.30 p. m.. vomited; 1.45 to 4.45 p. m., 24 drops of belladonna mixture hourly; ice bag over stomach; slept 45 minutes; very restless; complains of dryness of mouth and throat; pupils slightly dilated; 5.15 p. m., atropin sulphate, one-one hundredth grain (hypodermic tablet) by mouth; 5.30 p. m., vomited; 5.45 p. m., 24 drops of belladonna mixture; complains of intense nausea. It is almost impossible to retain the belladonna mixture. At 6.15 p. m., atropin sulphate, one-one hundredth grain; 6.45 p. m., 24 drops of belladonna mixture and magnesium sulphate, one-half ounce; 7.15 p. m., vomited; 7.30 p. m., atropin sulphate, one-one hundredth grain; 7.45 p. m., 24 drops of belladonna mixture; 8.15 p. m., atropin sulphate, one-one hundredth grain; 8.45 p. m., 24 drops of belladonna mixture; 9 p. m., vomited; 9.15 p. m., soap-suds enema; large, brown, liquid stool resulted; 9.45 p. m., 24 drops of belladonna mixture; very nervous and restless; 10 p. m., morphine sulphate, three-eighths grain, by hypo.; 10.45 and 11.45 p. m., 24 drops of belladonna mixture; sleeping.

October 14, 12.45 to 5.45 a. m., 24 drops of belladonna mixture every hour; sleeping at intervals; 6 a. m., 5 compound cathartic pills and 5 grains blue mass; 6.30 a. m., vomited 1 pill; 7.45 and 8.45 a. m., 24 drops of belladonna mixture; 8.55 a. m., vomited; 9 a. m., pulse rapid (112) and the heart action is beginning to get weak. Digitalin one one-hundredth grain and strychnine sulphate one-fiftieth grain by hypo.; 9.30 a. m., buttermilk 3 ounces; is not getting proper belladonna effect; atropine sulphate one one-hundredth grain; 9.45 a. m., 24 drops of belladonna mixture, brown fluid stool; 10.45 a. m., atropine sulphate one one-hundredth grain, magnesium sulphate 3 ounces; 11 a. m., vomited; 11.45 a. m.. 24 drops of belladonna mixture, complains of great thirst, mouth and throat very dry, pupils dilated; 12.15 p. m., soapsuds enema with soft brown stool; 1 p. m., calomel one-tenth grain every half hour, strychnine sulphate one-fiftieth grain and digitalin one one-hundredth grain by hypo.; 2 p. m. atropine sulphate one one-hundredth grain; 3 p. m., very restless and unruly, has marked belladonna effect and now vomits belladonna mixture at once; 4 p. m., stomach washed out with warm water containing sodium bicarbonate; 4.45 p. m., atropine sulphate one one-hundredth grain, patient complains of feeling badly, has a sense of apprehension and talks of running home, pulse stronger; 5 p. m., strychnine sulphate one-fiftieth grain and digitalin one one-hundredth grain by hypo., vomited; 5.30 p. m., atropine sulphate one one-hundredth grain, brown watery stool; 6.30 p. m., brown watery stool (from calomel which is being taken every half hour); 8 p. m., atropine sulphate one one-hundredth grain; 8.15 p. m., magnesium sulphate one-half ounce; 8.30 p. m., codeine phosphate 5 grains by hypo.; 9 p. m., calomel one-

fourth grain every hour, brown watery stool; 10 p. m., atropine sulphate one one-hundreth grain; 11 p. m., vomited; midnight, very nervous and restless, full belladonna effect, no effect from codeine.

October 15, 1 a. m., vomited; 1.15 a. m., atropine sulphate one one-hundredth grain; 5 a. m., atropine repeated, slept from 4 to 5 a. m.; 6 a. m., magnesium sulphate one-half ounce; 6.45 a. m., brown liquid stool; 7 a. m., vomited; 7.45 a. m., brown liquid stool, tinged with green; complains of paroxysms of formication; 9.15 a. m., strychnine sulphate one-fiftieth grain, digitalin one one-hundredth grain, and codeine phosphate 2½ grains, by hypo.; 9.20 a. m., green stool, vomited; 9.30 a. m. to noon, calomel one-tenth grain every half hour; 12.15 p. m., strychnine sulphate one-fiftieth grain, and digitalin one one-hundredth grain, by hypo.; 2 p. m., stomach washed out with sodium bicarbonate solution, castor oil 2 ounces, put into stomach through stomach tube; 3 p. m., vomited water with a little oil, pale green fluid stool; 3.15 p. m., strychnine sulphate one-fiftieth grain, and digitalin one one-hundredth grain, green liquid stool; 3.30 p. m., very restless, dionin 2 grains; 4.30 p. m., vomited; 7.30 p. m., trional 20 grains, and dionin 2 grains, green fluid stool; 7.45 p. m., vomited; 8 p. m. to midnight, sleeping; very nervous and restless between midnight and 2 a. m.; vomited frequently.

October 16, 2 a. m., dionin 2 grains, green fluid stool; 4.30 a. m., has slept 1½ hours, vomited on awakening; 8.30 a. m., sleeping since 5 a. m., awoke complaining of aches and pains in all limbs, hot milk 3 ounces, massage to limbs, which seemed to relieve the pains; 10 a. m., green fluid stool, feels weak and cold; 10.30 a. m., high rectal enema, which brought away a greenish-brown oily stool; 11.30 a. m., 1 pint of warm normal saline solution, containing brandy 1 ounce, slowly introduced into lower bowel, retained, slept 45 minutes; 1 p. m., beef tea 3 ounces; 2 p. m., hot water 8 ounces; 4.30 p. m., trional 20 grains, and dionin 2 grains, by mouth, followed by hot water 8 ounces; 5 p. m., has passed a quiet afternoon, complains of pains in knees and elbow joints, slept from 9 p. m. to midnight.

October 17, 1 a. m., vomited a little pale-green fluid; 7.30 a. m., slept most of the night, complains of pains in limbs and joints, took cup of hot milk and one piece of dry toast, pupils still dilated; 12.30 p. m., hot milk 8 ounces, beef tea 4 ounces, and one piece of dry toast; 2.30 p. m., still complains of pains, phenacetin 5 grains; 5.30 p. m., pains gone, trional 15 grains; 6 p. m., hot milk 8 ounces, two pieces of dry toast, and meat juice 1 ounce.

October 18, slept all night, no pains, no nausea, hungry, diet increased, comfortable throughout the day; 6 p. m., calomel grain one-half.

October 19, 7 a. m., slept all night, magnesium sulphate one-half ounce, appetite good, diet increased, no nausea, pupils normal and

react to light and accommodation, three soft green stools during the day, feels greatly improved, up in wheel chair.

October 20, on full diet, took her own bath, improving rapidly, cheerful and happy.

October 28, walking and playing tennis.

October 30, discharged from the sanatorium in excellent condition.

While the patient was in the sanatorium her home was moved to another part of the city in order that she might start in a new environment. She voluntarily gave to the writer her hypodermic syringe, and the prescription for the morphine tablets. Since her discharge she has steadily improved in health, and when last seen, February 10, 1914, she had no desire for the drug.

Alcohol.—In treating an alcoholic the belladonna mixture and the 5 compound cathartic pills with 5 grains of blue mass are given simultaneously at the first dose. The belladonna mixture is continued every hour of the day and every hour of the night the same as with the morphine patient. Twelve hours after the initial dose the cathartic is again given, also at the twenty-fourth hour, and again at the thirty-sixth hour, the cathartics being followed by salines if necessary. After these last cathartics the green, bilious stools should appear, and by the forty-fifth hour the castor oil is given. If the green stools do not appear, it is necessary to carry on the treatment over one or more cathartic periods until they do appear. The oil is not to be given until after the green stools have appeared.

Elderly or markedly alcoholic, nervous patients are given 2 ounces of whisky for 4 or 5 doses during the first 24 hours. It is also necessary to make these patients sleep, otherwise delirium tremens is apt to appear. Sleep is best produced in these cases by a mixture containing chloral hydrate, 20 grains; morphine sulphate, $\frac{1}{8}$ grain; tincture of hyoscyamus, $\frac{1}{2}$ dram; tincture of ginger, 10 minims; tincture of capsicum, 5 minims; and water, $\frac{1}{2}$ ounce. In these cases the heart should be closely watched, and cardiac stimulants, as strychnine and digitalis, should be administered after the first 24 hours, or sooner if indicated.

The period of convalescence requires care. The patient should be carefully fed and built up as quickly as possible. Regular exercise is essential, and one should aim to keep the patient busy at something throughout the day. This not only has a mental effect, but promotes a healthy fatigue which produces sleep at night. The following case illustrates the treatment of an alcoholic having a marked tolerance to belladonna:

The patient, A. K., seaman, age 50, with 22 years' service, a chronic alcoholic, was admitted to the sick list December 1, 1913. He had been drinking alcohol obtained from shellac and exhibited the well-known symptoms of chronic alcoholism. He was given a brisk

calomel purge, and in the evening chloral hydrate gr. xv, sodium bromide gr. xx, and strychnine sulphate gr. $\frac{1}{30}$. The purge and the sedative were repeated the following day. On December 3, at 6 a. m., the Towne-Lambert treatment was begun, as described above. Green stools did not appear until the evening of December 9, in spite of small doses of calomel, which were given every hour during the day, in addition to the compound cathartic pills and the blue mass. The belladonna effect was not obtained until the evening of December 7, and then only after the belladonna mixture (made with a 10 per cent tincture of belladonna) had been increased to an hourly dose of 45 drops. The course of treatment, with the exception of the above variation, was uneventful. There was little nausea, and the patient slept well with the aid of the above-mentioned sedative mixture. During convalescence the patient was fed frequently and was kept busy during the day. He slept well at night without a hypnotic. He was discharged to duty on December 15, 1913, in excellent condition. When last seen, February 10, 1914, he stated that he had no desire for alcohol. In fact, he had passed through the Christmas and New Year's festivities and a political celebration without taking a drink, much to the amazement of his shipmates.

Cocaine.—The cocaine habitué is to be treated like the alcoholic, except that no cocaine is to be given at any time, and a heart stimulent like strychnine or digitalis must be given from the beginning of the treatment. The treatment of this condition is not as promising as is that of the alcohol or morphine habit.

Tobacco.—To free a man from his tobacco habit alone, he may be allowed to taper off the first 24 hours, or he can be cut off abruptly and must be treated like the alcoholic.

When combinations of drugs are used the method employed is as follows:

Morphine and alcohol.—Patients who have been taking this combination should be treated for the morphine and can be tapered off at the same time from the alcohol. These patients are apt to have a severe gastritis, which lessens their ability to retain either food or medication. Sodium citrate in 5 or 10 grain doses every hour, either with or without 10 to 20 grains of cerium oxalate given every two hours, best relieves this condition. If these fail, a daily stomach lavage with a solution containing 2 drams of sodium bicarbonate to the pint of warm water will relieve the gastric irritability and allow the treatment to proceed more smoothly.

Morphine and cocaine.—This, according to Lambert, is the most difficult combination to treat. The cocaine is shut off at the beginning and the patient is treated like the morphine habitué. Usually, as the effect of the morphine wears off, these patients become deliri-

ous, unmanageable, unreasonable, and exceedingly ugly, and as they do not realize what they are doing, they make trying patients.

Alcohol and tobacco.—Many people who are periodic drunkards and whose periodicity occurs with no apparent cause are victims of chronic tobacco poisoning, which is the cause of their periodic alcoholic excesses. These folks smoke to excess and, becoming nervous, smoke more and more in order to allay the nervousness. Finally a limit is reached, and tobacco ceases to quiet them. Then they must take some narcotic to secure ease, and they turn to alcohol as the narcotic most readily procurable. These people are exceedingly intolerant to alcohol, and the first drink starts them off on a spree. Thus a vicious cycle is formed which can be broken only by eliminating the tobacco, and unless that is done by cutting off the tobacco at once and then treating the case as an alcoholic, the patient will stop neither of these drugs. They can not stop the periodic alcoholic excesses under the above-mentioned cyclic conditions, and the only chance for relief is to stop the tobacco.

The cases of drug habit which a naval medical officer may be called upon to treat come to him only as an emergency, as did the morphine case above outlined. From a service point of view, cases of drug intoxication occurring among enlisted men are best handled by a board of survey, with ultimate discharge from the Navy. These men are, as a rule, degenerates or phychasthenics, and as the liability of relapse among them is great, it is believed that the results do not justify the care, energy, and worry which the Towne-Lambert treatment entails. However, in the service there will at times arise worthy cases, either in the enlisted or the commissioned personnel or in their families, which will justify the expenditure of earnest endeavor to save them from themselves.

MEDICAL EXPERIENCES IN THE AMAZONIAN TROPICS.[1]

By C. C. Ammerman, assistant surgeon, Medical Reserve Corps, United States Navy.

The subject of tropical medicine is a large and deep one, upon which much study has been done and many books written by expert and learned authorities. Upon being asked to address you on this general subject and casting about for a title, it occurred to me that something in the line of personal tropical experiences from a medical standpoint might be of more interest to you than an attempt to write a technical or scientific paper on one of the grave tropical diseases. I shall therefore relate to you this evening some of the medical experiences met with during the years 1911, 1912, and the early part of 1913, while serving as division surgeon of the Madeira-

[1] Read before the College of Physicians of Pittsburgh, Pa., Nov. 13, 1913.

Mamore Railway Co. in Brazil and Bolivia, on or contiguous to the Amazon, Madeira, and Mamore Rivers in Brazil, and the Abuna, Yata, Beni, and Madre de Dios Rivers in Bolivia.

The Madeira-Mamore Railway was built by a company incorporated in the State of Maine, U. S. A. The road was constructed for the Brazilian Government to carry the merchandise and supplies for, and the natural products from, Bolivia, en route to and from the Atlantic Ocean. It serves all that northeastern portion of Bolivia east of the Andes Mountains that is drained by the Beni and Madre de Dios Rivers. The political reason for its being built was a treaty between the two nations, after Brazil had wrested a large slice of territory from Bolivia, giving to Bolivia the use of the Amazon and its tributaries from the south for domestic transportation. This treaty also made it obligatory for Brazil to construct a railway around the rapids of the Madeira River. The railroad is built on Brazilian territory, paralleling the Madeira and Mamore Rivers. It extends from Porto Velho, near Santo Antonio, in the State of Amazonas, south to Guajara-Merim, in the State of Matto Grosso. It is 366 kilometers, or about 227 miles, in length. It was commenced in September, 1907, and finished in July, 1912. The cost of construction was about 10,000 lives and $32,000,000.

An attempt to build this road was made in 1878, but was abandoned after about nine months and the death of nearly all the original party. The sufferings and horrors of this party are graphically told in "Recollections of an Ill-Fated Expedition to the Headwaters of the Madeira River in Brazil," by Neville B. Craig, published by J. B. Lippincott Co. in 1907.

Previous to this time many explorations of these waterways had been made, and our Navy took an important part. In the year 1851 Lieut. Lardner Gibbon, United States Navy, made the first thorough exploration of the route from Bolivia to the seacoast at Para. He was accompanied by Lieut. Herndon, United States Navy. These young officers were ordered by the Secretary of the Navy to proceed overland from Peru and examine the waterways connecting the interior with the Atlantic seaboard. They proceeded by way of the Chapare, Mamore, Madeira, and Amazon Rivers from the eastern slope of the Bolivian Andes, going overland to Vinchuta, in Bolivia, and thence by canoe all the way to Para. In writing of this trip of Lieut. Gibbon, Mr. Craig says—

Notwithstanding the fact that his party was poorly equipped, one can not read his report to-day without a feeling of astonishment at the amount and reliability of the information he was able to collect in a very short time. * * * An accident having destroyed his barometer, with no instrument other than a hastily improvised boiling-point apparatus consisting of a coffee-pot and a thermometer, he took observations for altitude that enabled him to construct an approximately correct profile of his entire route across the continent of South America.

The early promotion of this work was done by Col. George Earl Church, a native of New Bedford, Mass. U. S. A

Some time in 1877 Col. Church called upon President Grant, in Washington, to explain the great need of a survey of the lower Amazon and Madeira Rivers. The President at once recognized the necessity of the work, and promptly issued orders that led to the dispatch of the U. S. S. *Enterprise*, under Commander Thomas O. Selfridge, with instructions to map the Madeira and Amazon from San Antonio to the sea. The mission of the *Enterprise* was the direct outcome of the keen interest taken in Col. Church's projects by President Grant, who, with his administration, early realized the huge benefits which would accrue to the United States from the construction of the Madeira-Mamore Railway, and the opening to commerce of the immense and fertile territories in Brazil, Bolivia, and Peru. The Government at Washington impressed on its diplomatic and consular officers, in the South American countries affected, the importance of lending all proper assistance to Col. Church and his companies. (Quoted from Craig's "Ill-fated Expedition.")

The principal native product now carried over this railway is crude rubber. The freight on carload lots over the road is $4,500 gold. The passenger fare for the same trip is $125 gold. The time now consumed by a passenger or a car of freight making the trip over the road is about 20 hours. In former days it took a native cargo boat, loaded, about 40 days to make the corresponding trip down the river, and from 90 to 150 days up the rivers. The many impassible falls and rapids make it necessary to unload every few miles, carry the cargo and haul the boats around on land, and reload. These boats, or *batelaos*, carry about 25 tons of cargo and are manned by about 30 rowers or paddlers, who propel the craft by means of short paddles about the size and shape of our canoe paddles. The usual crews are native Brazilleros or native Bolivian *mosos*.

The time necessary to make the trip to-day from New York to Porto Velho is about 32 days as the minimum time; 8 days to Barbados; 4 days to Para; 6 days to Manaos at the junction of the Amazon, Madeira, and Rio Negro; and anywhere from 10 to 30 days up the Madeira to Porto Velho. The distance is 1,000 miles up the Amazon, and about 900 miles up the Madeira to the northern terminus of the railroad, which is situated about 9° 30′ south latitude.

We maintained a hospital at Candelaria, between Porto Velho and Santo Antonio, containing about 600 beds. The operating rooms were modern in every way, and their furnishings and equipment would be objects of pride in any small city in our own country. From November, 1907, to December 31, 1912, the total admissions were 31,360. The deaths during the same time were upward of 6,600. These figures do not include either admissions or deaths in the field hospitals serving the many construction camps at "the front." The medical corps during the construction days consisted of about 25 physicians and surgeons. The hospital corps comprised 6 trained

FIG. 1.—SMALL BOLIVIAN BATELAOS.

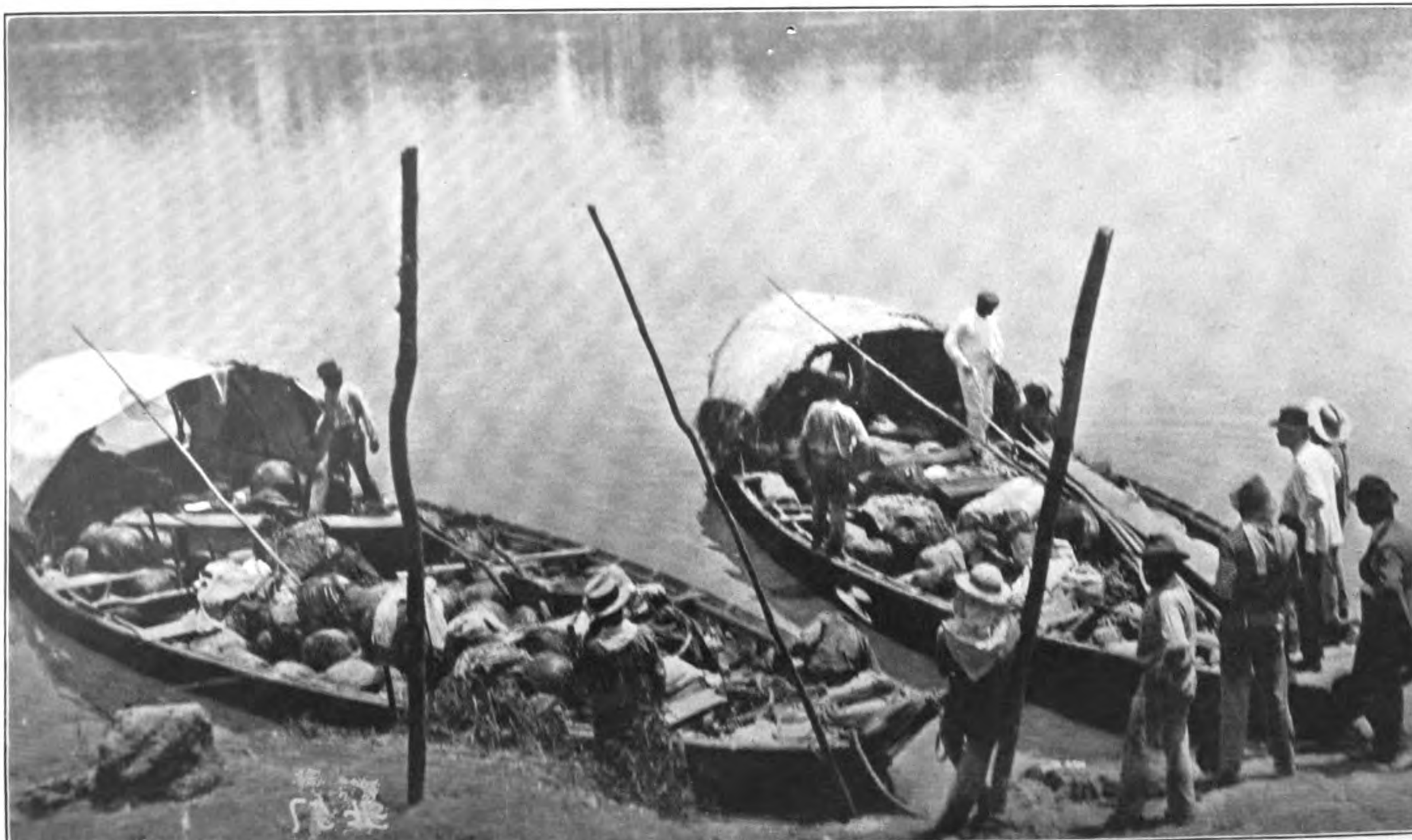


FIG. 2. BRAZILIAN BATELAOS LOADED WITH RUBBER.

female nurses (1 in charge of each ward), 20 male nurses, and plenty of orderlies, cooks, flunkeys, etc. This entire force was under the able and efficient direction of Dr. Carl Lovelace, of Texas, to whose wisdom, executive ability, and unchanging good humor in the face of many discouragements, together with a strict sense of discipline and justice, was due, in a very great measure, the possibility of completing this exceedingly difficult and dangerous enterprise. I consider it an honor as well as a pleasure to have been associated with so great and so good a man as "our chief."

Only the Anglo-Saxons could have completed this undertaking, and even they could not have done so without the aid and the knowledge of a modernly educated and scientifically equipped medical corps, who were brave and heroic in the face of dangers greater than battles—dangers from disease and death that had to be faced daily and hourly, and which are not at all to be appreciated by those who did not experience them.

The laborers and employees whom we treated were from almost every race and clime—college-bred engineers and clerks from England and America; Spaniards from Mexico, Central America, West Indies, South American countries, and Spain; Portuguese, both native Brazilleros and from Portugal; Germans, Italians, French, Greeks, Turks; negroes from the United States, Cuba, Barbadoes, Trinidad, Hayti, British Guiana, and Brazil; Singhs and Sikhs from India; native Indians, both friendly and savage; and many others. It therefore may readily be understood that our practice was not confined to tropical diseases, but that at one time or another we were almost certain to meet with nearly every disease and injury known to man. In fact, as I recall at this time, the only disease that was conspicuous by its absence was bubonic plague.

The principal diseases met were malaria, blackwater fever, dysentery of all kinds—catarrhal, bacillary, and amebic—abscess of liver, yellow fever, beriberi, typhoid fever, tuberculosis, pneumonia, yaws, tropical buboes, uncinariasis, filariasis, and tropical ulcers. Surgical conditions of all kinds were present, from abscesses to appendicitis, arrow wounds to amputations, boils to blood poisoning, knife and gunshot wounds, burns from explosives, fractures, snake bites, and the many and varied injuries constantly arising from the average railroad construction and the operation of train service. It may be stated, however, that the number of accidents and injuries on this work was considerably less than usually occurs on the same class of construction and operation in the United States.

The "captain of the men of death" was malarial fever. More disability, suffering, and death were caused by malarial infections than by all other diseases and injuries combined. This is probably true of all parts of the Tropics, or at least was until the advent

of Anglo-Saxon physicians with their intelligent methods in preventive medicine and prophylaxis. It has been said by Sir Patrick Manson that malarial infections cause more deaths annually in the world than have ever been caused in any one year by any great epidemic of cholera or plague.

We saw malaria in all its varied characters, from the slow chronic cachexia that caused the anemic patient to be invalided home, to the fulminating paroxysm that, attacking an apparently well and husky individual, terminated his existence within a few hours. While we saw all the different forms—quotidian, tertian, quartan, anticipating, postponing, subintrant, remittent continued, double and mixed infections—by far the greater number of our cases was of the estivo-autumnal variety. A noteworthy fact as seen in our work was the general absence of chills at the beginning of most of the acute attacks. In such cases there was either an absence or a great shortening of the rigor, a prolongation of the pyrexial stage, followed by a long period of weakness and depression, with a great tendency to adynamic conditions. Anorexia, great thirst, vomiting, pains in the limbs and back, and frequent delirium characterized the onset of the attacks. At any time during the continuation of any of these symptoms the patient was likely to pass into a condition of the gravest danger. After apparent recovery there was a great liability to a return of the fever at regular intervals of days, weeks, or months. I saw one case, an American, in which the attacks recurred about the 25th of each succeeding second month, never varying more than two days from this date, and never skipping a 2-month's period during the 18 months he was under my care and observation. I have frequently met men on the grading at their work in the morning who appeared strong and well and had no complaint to make. On making the rounds in the afternoon they would be found resting in their hammocks complaining of "fiebre," and on the next morning's visit would learn they had expired during the night. Such cases, being scattered over the right of way for greater or less distances from our camps, could not be gotten into a camp hospital before death claimed them.

Cerebral forms of malaria were not infrequent. Two of our physicians met death in the line of duty from this cause. I wish here to report briefly a case of this kind that occurred in my service in 1911, soon after I arrived in the country, and was sent to take charge of the field hospital at Villa Murtinho, or Camp 42, as it was officially designated.

F. J. de C., Spaniard, nativity, Madrid, age 20. Had been in the hospital eight days previous to my arrival, complaining of loss of appetite, headache, and general debility. Temperature chart taken twice daily showed a continual subnormal temperature during the

FIG. 3.—CANDELARIA HOSPITAL.

FIG. 4. -CONSTRUCTION CAMP, SHOWING TYPES OF BARRACKS.

time mentioned, ranging between 36.4° and 36.9° C. Pulse and respiration about the normal. Physical examination had revealed no abnormalities of the internal organs except the spleen, which was considerably enlarged and easily palpable. No albuminuria. Has had three attacks of fever during the past eight months, which is the time he has resided in Brazil. The last attack was about two months ago when he was ill and away from his work five days. Is suspected of malingering and has been so advised. On September 26, at 12.30 p. m., I was hastily summoned by a message from the nurse in charge stating that the patient had just had a convulsion and was dying. Upon my arrival a few moments later, he was found lying on the ground, where he had thrown himself from his hammock. He was in a state of coma and failed to respond to any sort of sensory stimulation. He was returned to his hammock, and a diagnosis of cerebral malaria having been made, he was immediately given 1½ grams of quinine intramuscularly. Two hours later this dose was repeated, again at 6 p. m., and yet again at 9.30 p m., making 90 grains of quinine that had been injected into the gluteal muscles in nine hours. The following morning there seemed a slight improvement in his condition, but he was still unconscious. The same treatment was ordered to be continued, and he was given 1½ grams of quinine intramuscularly at hours 7, 10, 1, 4, 7, and 10 o'clock, making a total of 135 grains for the day. This condition continued for six days, during which time nourishment was administered through a nasal tube to the stomach, and the same medication kept up. On the evening of the sixth day he roused up and asked for a drink of water, drank, sighed, and seemed to pass into a state of natural slumber from which he would awaken when loudly addressed. During these six days his axillary temperature had ranged between 38.5° and 39.8° C. The following morning he awakened naturally with a temperature of 37° C. Injections of quinine were then reduced to three per day (67½ gr.) and kept up during the following 10 days, when he was put on quinine grains X, t. i. d. in capsules, by mouth, and Blaud's pills with arsenic and strychnine, No. ii, t. i. d., with orders to reduce the quantity of quinine 5 grains every third day until the amount was reduced to 10 grains per day, which quantity he was directed to take daily so long as he should remain in that country, and for at least three months after leaving the Tropics. After the patient regained consciousness he was markedly deficient mentally for several days, but gradually recovered, and after 10 days was allowed to go about alone. One week later, or 23 days after the convulsion, he was discharged and returned to his work as a laborer. He remained under my observation about four months, during which time he took his quinine religiously and performed his allotted task daily. After this time, owing to a change in station, I lost sight of him.

In such a case as this at home I would have wasted valuable time searching for some injury or obscure brain lesion to account for such a condition, during which time the patient probably would have died. I am convinced that the prompt and constant administration of large doses of soluble quinine saved both his life and reason. Among my records are notes of seven more similar cases, two of which died, one recovered with loss of his mental faculties, and four made uneventful recoveries.

The prophylaxis and treatment of malaria is so familiar to all of us now that there is little for me to add. We are all acquainted with the work done on the Canal Zone by Col. Gorgas and his corps of physicians and sanitarians, and we know that the great point is the elimination of the mosquitoes, and that this can most surely be accomplished if the funds are available. Owing to the temporary character of our construction camps, the long distance over which our men were scattered, the exceedingly large swamps through which we penetrated, and a limitation of funds, we were unable to be as thorough as they in our efforts to eliminate the mosquitoes. When a new camp was located, as dry ground as could be found was selected, the jungle cleared away for about 100 meters in all directions from the building sites, good drainage made, latrines carefully located, and proper provision made for garbage disposal. The medical officer of each camp was furnished a sufficient sanitary squad to keep the camp clean and well policed. Boiled and filtered water was prepared and kept on hand at all times in sufficient quantities to supply freely every man. A plentiful supply of lime, sulphur, and crude oil was always at hand and was freely used. Every man was furnished with mosquito bars for his cot or hammock and compelled to use them. All permanent buildings were thoroughly screened with wire screens, with double or triple doors at entrances and exits. As we could not destroy all the mosquitoes, our aim was to have every man so equipped and instructed that he could protect himself from them when at rest and refreshment.

We found that quinine was the only drug on which we could depend to prevent or cure malarial infections. Every man was instructed and urged to take from 5 to 10 grains daily as a prophylactic. We used it in solution, in capsules, and in hypodermic form. We administered it by mouth, by rectum, by inunction, intravenously, and intramuscularly. The greater portion that we used was the hydrochloride in 5-grain capsules. These came to us in sealed tins, each containing 1,000 filled capsules, and were purchased in 5,000,000-capsule lots. For many months I was in charge of the southern division of the railroad between Abuna and Guajara-Merim, covering 150 kilometers of track daily in a gasoline railway motor car and

FIG. 5.—PARTIALLY GRADED RIGHT OF WAY.

FIG. 6.—JUNGLE SCENE AT HIGH WATER.

looking after upward of 2,000 employees. During this time I dispensed daily on an average 6 tins of quinine capsules, or 30,000 grains of quinine per day.

For intramuscular injections we used the "chloro-sulfate" put up in glass ampoules each containing one-half gram. Our experience with this form of quinine medication was very gratifying. We administered it with a hypodermic syringe at all times and under all conditions—in the hospital, in the field hospitals, in camps, in the palm huts of laborers, and along the right of way, from our motor cars—and had very, very few bad results from sloughing or abscess.

In a series of 630 injections I had only 6 abscesses, and in this same series there occurred 457 consecutive injections without a slough or an abscess. Even had we gotten a great number of abscesses and "quinine sloughings," I would have continued to use it in this manner, believing that a live patient with an abscess is greatly to be preferred to a dead one without.

My routine method of giving these injections was as follows: In my kit I carried iodine, alcohol, water, and cotton. While water could be gotten at almost any time or place, having it at hand saved time and useless steps. I used an all-glass hypodermic syringe, large enough to hold three ampoules of quinine, with platinum needles of extra length. The syringe and needles were carried within a small metal case containing a metal spring clamp to hold the syringe securely. After opening case the cover was use as a base and lamp, the spring clamp placed therein as a rack or support, on which the large part of the case was placed. The upper portion, or basin, was then filled with water in which the syringe and needles were placed; the lower portion, or lamp, was then filled with alcohol and ignited. This made a very good emergency sterilizer, and by the time the alcohol had burned out the syringe and needles were well boiled. While waiting for this the patient had been placed in position, and the desired location exposed, which was usually one of the buttocks. Iodine was next applied to the place where needle was to be inserted, without having first cleansed or moistened the spot with either alcohol or water. The needle was then quickly inserted at right angles to the plane of the surface, deeply into the gluteal muscle. The fluid was then injected very slowly, consuming from one to two minutes of time to empty the syringe. The puncture was then closed with a drop of collodion and a bit of cotton. It was noted, both by observation and personal experience, that if the fluid was injected very quickly it produced a tearing sensation that was extremely painful, whereas if the solution was given time to find a way for itself between the muscle fibers very little pain or discomfort was caused. It was also noted that a gentle kneading of the tissues, after

the injection was completed, tended greatly to mitigate the following pain and soreness. Injections were given alternately in the right and left buttocks, and after the third and subsequent injections care was taken to avoid the indurated spots of previous injections.

Different persons required different doses of quinine as a prophylactic, and this dosage could be ascertained only by time and patience. In many cases attacks of fever could not be prevented by any dosage. In my own case, after several attacks of fever, I learned that 30 grains per day was necessary. If I dropped back to 25 grains per day I would soon have another attack. As a result of this observation, for over a year I took 30 grains in solution daily, and kept this up until after my return home, when the amount was very gradually reduced until the first of last September, when it was discontinued. I have both given and taken 160 grains per day, intramuscularly, for several days in succession, without any ill effects, with very little tinnitus, and no nausea. Such doses given in the United States would almost render one liable to a charge of malpractice. In spite of these large doses I did not see a case of quinine amblyopia or a case of permanent deafness, although temporary deafness was rather frequently noted. Our men worked at times in the swamps in water to their waists, and sometimes to their armpits, as well as frequently being forced to swim the larger streams. They were frequently drenched by tropical rains, and being unable to change into dry clothing, remained at work until dried by the hot sunshine, or in the absence of sunshine they remained wet until the day's work was finished, and on the following morning were often forced to don the wet clothing which had been removed the evening previous. They were constantly exposed to every inclemency of the weather and season except cold, and at times in the wee, small hours of the night there was a relative coldness that was chilly and very trying to their weakened constitutions. As a result of these conditions they frequently became very ill. When ill, prompt and energetic measures and treatment were necessary to save their lives and health.

Yellow fever is endemic in the Amazon Valley. In the hotels and *pensions* of Manaos it is not unusual to see several dead bodies being removed from the buildings during the morning, who have perished from this disease during the preceding night. The natives pay but little attention to this disease, and will not, of their own volition, do anything or make any effort to prevent its occurrence or spread. In a jocular manner it is frequently alluded to by them as "fiebre patriotica," because it removes the foreigners and more particularly the "gringos."

The company's steamers plying on the rivers between Manaos and Porto Velho carried company physicians who watched carefully for

FIG. 7.—KARIPUNA INDIAN CHIEF, WIFE, AND TWO SONS.

The chief's leg was amputated as a result of snake bite.

FIG. 8.—SUBCHIEF, KARIPUNA INDIANS, WITH NATIVE BOW AND ARROW.

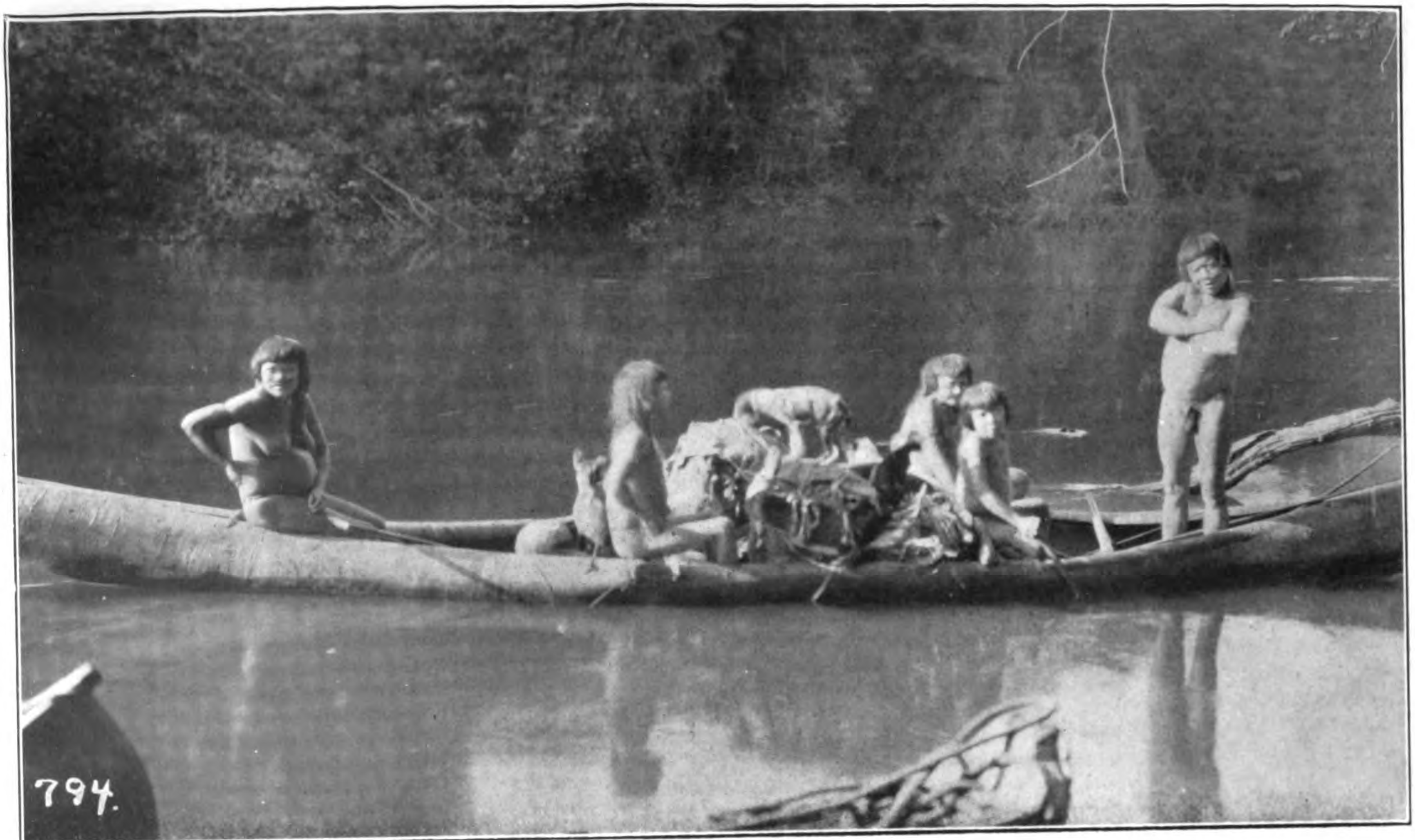


FIG. 9.—KARIPUNA INDIAN FAMILY IN NATIVE BARK CANOE.

FIG. 13.—TOWN OF ABUNA, BRAZIL.

FIG. 14.—TYPE OF HOUSES FUMIGATED DURING YELLOW FEVER OUTBREAK.

any appearance of the disease among the passengers en route to our works. All other vessels arriving at Porto Velho were met by our own port medical officer, who carefully inspected the crew and passengers before permitting them to land. An island about 4 miles from the main hospital was maintained as a quarantine station, where all suspected cases were kept until the danger was past. Passengers from infected boats and suspects refusing to go to quarantine, were not allowed to land in the company's port, or to be on their right of way, or to purchase transportation over the line. By these means, while we had many cases of yellow fever on the island and in the main hospital, there was but one outbreak of the disease up the line.

In November, 1911, an outbreak occurred in the town of Abuna, containing about 400 inhabitants all told. As I happened to arrive in this town the next night, I received orders to remain there and assist in caring for the camp, maintaining quarantine, cleaning up, fumigating, etc. I am free to confess that at that time I had an unusually intense longing for home, and I might also truthfully add that the fear of being thought a coward may have had a strong influence in keeping me there.

A strict quarantine was inaugurated and maintained. Trains were not allowed to stop within 6 kilometers of the place. The laborers who could not be sent away were instructed how to protect themselves, watched carefully, and so far as possible compelled to follow the instructions given to them. A sanitary squad of 80 men under an efficient sanitarian was put to work, many native huts and shacks burned, the more pretentious company buildings thoroughly fumigated, and everything possible screened. All American and other white men were required to be inside the screened quarters before sunset and remain there until sunrise. Any laborer having any rise in temperature or any evidence of illness was immediately sent to Candelaria Hospital in screened hospital cars under guard. This quarantine was maintained from November 4 until January 1, and after the first 10 days no new cases developed. Two very interesting things were noted during this time: First, that the stegomyia mosquito is very domestic in its habits and migrates from building to building but little, if at all, especially during the daylight hours. Second, that it is possible to fumigate successfully more or less openly constructed palm-thatched and palm-walled buildings.

These buildings were completely covered with heavy canvas extending from the ground up to and over the roof and down to the ground on the opposite side. Both ends of the canvas were then buried under 6 or 8 inches of earth well tamped down, so that when

finished the building was completely and thoroughly covered with this canvas; a half barrel of sulphur was placed within the building and ignited, the whole being then carefully kept closed and undisturbed for 24 hours. The floor and the ground under the floor would then be found covered with numberless dead mosquitoes which were removed and disposed of.

We moved about the camp with impunity during the day, performing our professional duties, but carefully refraining from venturing out or going about after nightfall. No one employed in the performance of any of the tasks mentioned contracted the disease.

UNITED STATES NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the pathological collection, United States Naval Medical School, January to April, 1914.

Accession No.	Tissue.	Diagnosis.	Collected by or received from—
1072	Blood	Spirochæta duttoni	Dr. G. B. Crow, New York Post Grad. Hospital.
1074	Blood	Trypanosoma equiperdum.	Do.
1075	Blood	Trypanosoma evansi	Do
1080	Ball of shellac	Poisoning by methyl alcohol.	Dr. F. C. Cook, Naval Hospital, Puget Sound, Washington.
1082	Blood	Trypanosoma brucei	Dr. G. B. Crow, New York Post Grad. Hospital.
1083	Blood	Benign tertian malaria	Dr. H. L. Kelley, 2d Regiment Marines.
1086	Tissue	Blastomycosis	Dr. G. B. Crow, New York Post Grad. Hospital.

Additions to the helminthological collection, United States Naval Medical School, January to April, 1914.

Accession No.	Parasite.	Host.	Collected by or received from—
19890	Filaria immitis	Dog	Dr. J. C. Parham and Dr. C. F. Ely, Naval Station, Tutuila, Samoa.
19892	Dibothriocephalus	Homo	Dr. G. B. Crow, New York Post Grad. Hospital.
19895	Ova of hookworm and tapeworm	Homo	Naval Hospital, Culebra, P. R.
19897	Schistosomum mansoni	Homo	Dr. G. B. Crow, New York Post Grad. Hospital.

SUGGESTED DEVICES.

AN EASY METHOD FOR OBTAINING BLOOD CULTURES AND FOR PREPARING BLOOD AGAR.

By E. R. Stitt, medical inspector, and G. F. Clark, passed assistant surgeon, United States Navy.

The apparatus illustrated by the accompanying cut is used for obtaining blood from a vein.

A tourniquet is placed on the arm to distend the veins of the forearm.

The site selected is painted with tincture of iodine, the needle introduced and sufficient blood is aspirated into the flask, which contains 1 per cent solution of sodium citrate in bouillon or normal salt solution.

Usually about 20 c. c. of blood are drawn into 40 c. c. of solution or bouillon in the flask. To avoid a hematoma, the tourniquet is removed before the needle is withdrawn from the vein. It is well to remove the iodine by alcohol and sterile gauze.

The flask is well shaken and, after flaming the lip, about 2 or 3 c. c. of the blood mixture are poured into a tube of glucose neutral red bouillon to detect any gas producer; about 15 c. c. of the mixture are then poured into a flask containing 100 c. c. of glucose bouillon. Several tubes of 2.5 per cent agar are liquified, cooled to 45° and, for each 2 volumes of agar 1 volume of blood mixture is added. The tubes should be rolled between the hands to insure mixing. They may then be slanted or poured into Petri dishes. The blood mixture may also be added to tubes of bile media or bouillon in varying amounts.

Blood from a normal individual has been used for preparing blood mixtures, into which various of the more delicate organisms were inoculated and recovered. The organisms used were pneumococci, streptococci, influenza bacillus, gonococcus, and others which grow more readily.

The blood-agar plates, prepared as above, may be used for plating work in obtaining pure cultures of gonococci, *B. influenzae*, etc., the pus or secretion being mixed with a small amount of bouillon, a loopful of the mixture placed on the surface of the blood-agar plate,

and distributed by a bent glass rod which can be carried to one or two other plates without recharging, and so obtaining colonies that are well separated.

The advantages of the method lie in its simplicity; the rapidity with which it can be done; the fact that any dilution of blood may be obtained; several media may be used; both anaerobic and aerobic methods of cultivation may be carried out.

HUMIDITY-REGULATING DEVICE ON A MODERN BATTLESHIP.

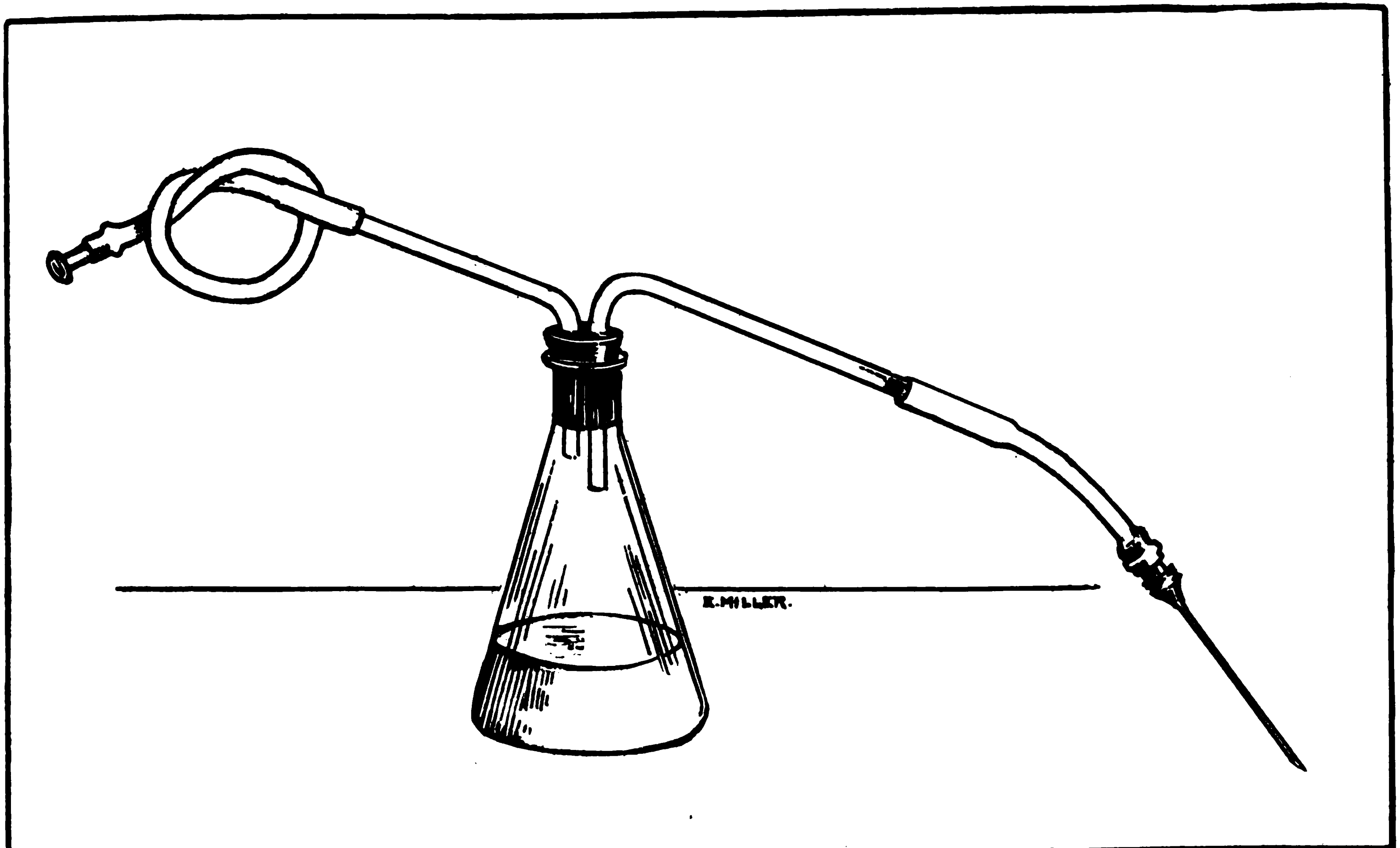
By R. C. RANSDELL, passed assistant surgeon, United States Navy.

The oldest of problems of the naval hygienist was and is ventilation. He has had his question of supply, and equally as much his question of moisture content. But whereas to our predecessor the fear was from oversaturation, we now have, with the newer systems of combined supply and heating, an overdrying of the air to contend with.

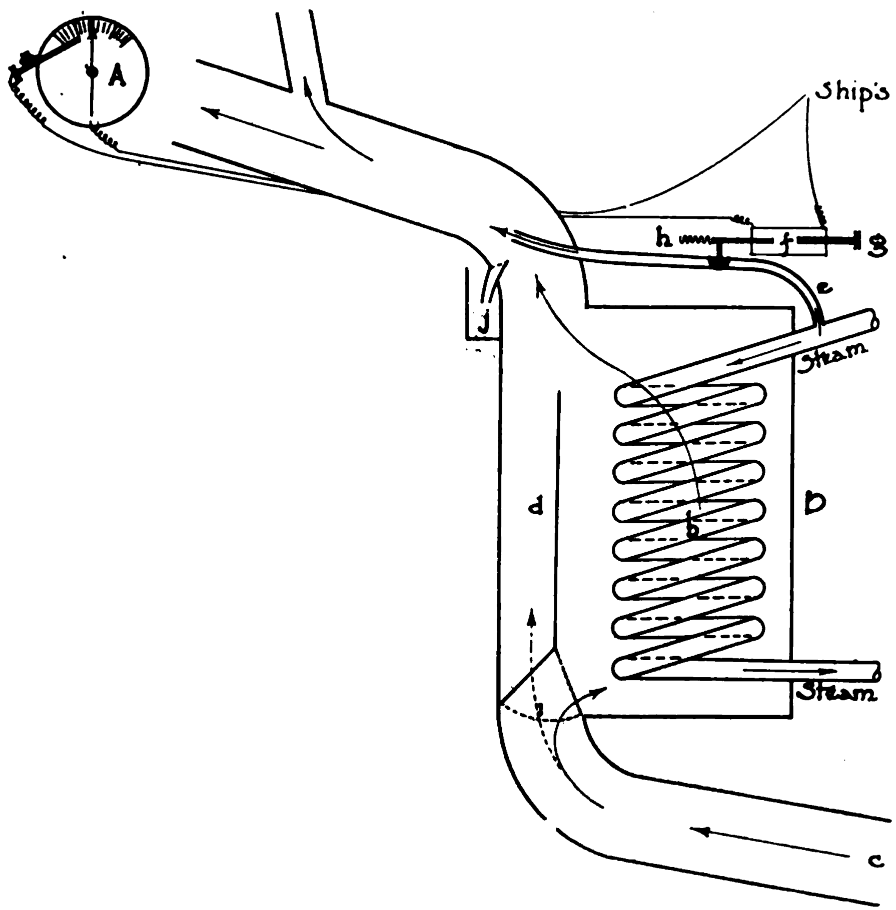
The present-day battleships and commercial liners are equipped with a supply system which passes in its course over steam coils, which either let the cold air pass or heat it as needed, according to the season of the year. This newer problem I speak of confines itself to the months requiring the addition of the heat. While this method is now universally recognized as a permanent step in advance, the question of regulation of humidity has been glossed over.

During our winter months air entering the supply system may be given an average of 32° F. and 75 per cent of saturation. Each cubic foot of air will contain approximately 1.5 gr. of water. Raise the temperature of this by your thermotanks to 75° at exit from terminals and your result will be an expansion of this air until, where we should have approximately 7 gr. of water to give a comfortable 75 per cent of saturation, we have instead still only the 1.5 gr. contained in the original cubic foot. We have here a relative humidity of about 16. Of course, this moisture content is immediately raised to some extent by body moisture from inhabitants of the living spaces and by admixture with already present air. But during observations made I uniformly found the relative humidity to be reduced to a point decidedly inimical to health and causing constant personal discomfort from excessive drying of mucous surfaces. During the use of the coils the humidity in the officers' quarters never was above 40 per cent; at times as slow as 15 per cent. This was not so noticeable in crew spaces, owing to larger presence of bodily moisture.

The varying needs of different compartments make necessary an increasing number of units of supply, avoiding as far as possible placing on the same system spaces widely differing in demands, such



APPARATUS FOR OBTAINING BLOOD CULTURES.



A-Mitthof or any dial recording hygrometer
a-Adjustable screw arm with which pointer makes contact
D-Steam box or thermo tank
b-Steam coils
c-Air entering from fan and either passing thru "D" to be heated or thru by pass "d" when heat is not needed.
e-Half inch brass pipe with valve connected with steam coils
f-Solenoid with rigid arm
g-Screw to adjust length of pull
h-Spring
i-Hot or cold cut off
j-Funnel and drip pan to catch water of condensation

HUMIDITY REGULATING DEVICE.

as brigs and officers' quarters. (The brig space should have an independent fan and tank.) The necessity of preserving the integrity of water-tight bulkheads has forced the installation of an increasing number of units.

Another point neglected is control of heat supply. What modern office building or apartment house would submit to having the janitor turn on or off steam in such apartments as he personally inspected or as the tenants clamored for? And why a structure housing 1,000 individuals should be deprived of one of the elemental comforts of modern living, rego-thermic control, to say nothing of humidity control, when such adds practically nothing to displacement and very little to cost, is to me an unanswerable question.

There are a few cumbersome and complicated devices patented for control of moisture in heated living spaces. I know of none practically applicable to shipboard. I have devised an automatic humidity supplying and regulating device for use on shipboard or such other places where artificial ventilation is used, such ventilating system being of the type using the thermotank method, i. e., that of forcing the air, when heat is desired, over steam coils.

The great disadvantage of this now universally accepted method is the extreme dryness of the air produced when passed over the hot coils, humidity being lowered as far as 10 to 15 per cent of saturation.

Tanks are now in use on the newest merchant liners, having a valve to be turned on by hand as desired, furnishing steam to add moisture to the current of air after leaving the coils, but I am not cognizant of any automatic control of this.

My device employs a dial-recording hygrometer (Mithoff), to which I affix an adjustable screw arm (*a*), regulated to such point on the dial as it is desired that the humidity should be. There is generally an error in these hygrometers working on a spiral spring, and this can be compensated for by occasional comparisons with a sling psychrometer, and adjustments made with the screw to add to or subtract from the dial figure. This arm (*a*) is insulated from contact with the hygrometer except with the pointer and is the terminal of one pole. The other pole is connected with the mechanism of the hygrometer and thus into the pointer. The latter, swinging down from 60 or 70 as the hot-air supply begins to dry out the air, reaches the point of lowest desirable saturation and makes contact with the screw arm, closing the circuit, and the solenoid (*f*) in drawing in its core pulls on the handle of the small steam valve at (*e*) and opens the valve. The addition of this moisture soon carries the indicator up again, breaks contact, and the pull of the spring (*h*) closes the valve. The screw at (*g*) regulates the length of pull of the solenoid and the amount of opening of the steam valve.

If the contact of the pointer is too light to produce the desired effect, a reducer can be placed between the hygrometer and the coil.

It may be suggested that the hygrometer itself is too delicate to withstand the shock of turret firing. Mine was in my room at a time when the latter was a scene of almost total devastation, following experimental firing of the forward turrets over the deck, but the accuracy of the instrument was not affected. However, it would be advisable to have the locker containing the hygrometer installed as far as possible from any source of shock. A location should be very carefully selected representing as near as possible an average of the air conditions of the space supplied by its thermotank.

It would be advisable that the medical officer have the supervision of the care and working of the system, with orders for routine inspection when in use.

CLINICAL NOTES.

LATERAL SINUS THROMBOSIS, REPORT OF CASE.

By G. F. COTTLE, passed assistant surgeon, United States Navy.

In the practice of the naval surgeon, cases of otitis media are very common. The treatment of these cases is simple and the results fairly good. In private practice it is common to turn these cases over to the aural surgeon. The naval surgeon often finds himself in places far removed from medical centers where help from outside sources can not be obtained. He must care for otitis media and also for the complications of this disease. Of necessity, therefore, he must fit himself thoroughly in this field of therapeutics. The report of the Surgeon General for the year 1911–12 shows 31 cases of mastoiditis operated on during that year. This number of cases means that the experience of the individual naval surgeon in this field of surgery is of necessity limited. What to the aural surgeon is an every-day affair is to the naval surgeon a rarity, yet he must keep himself fully alive to the best mode of procedure in aural surgery if his patients are to receive the care they have a right to expect. How well this serious condition has been met is shown by the same report:

	Cured.	Improved.	Died.	Invalided.
Mastoiditis:				
Incised and drained	19	11	1	2
Trephined		1		

Still more limited must be the experience of the individual naval surgeon with the more rare complications of mastoiditis, namely, brain abscess, meningitis, and sinus thrombosis. Here again he finds himself less fortunate than his brother in private practice who can call upon the aural surgeon to relieve him of responsibility. He must keep himself ever prepared to trephine for abscess, cerebral or cerebellar; ready to open the lateral sinus, to ligate or exsect the jugular vein; or even in rare instances to drain the subdural space or the lateral ventricles.

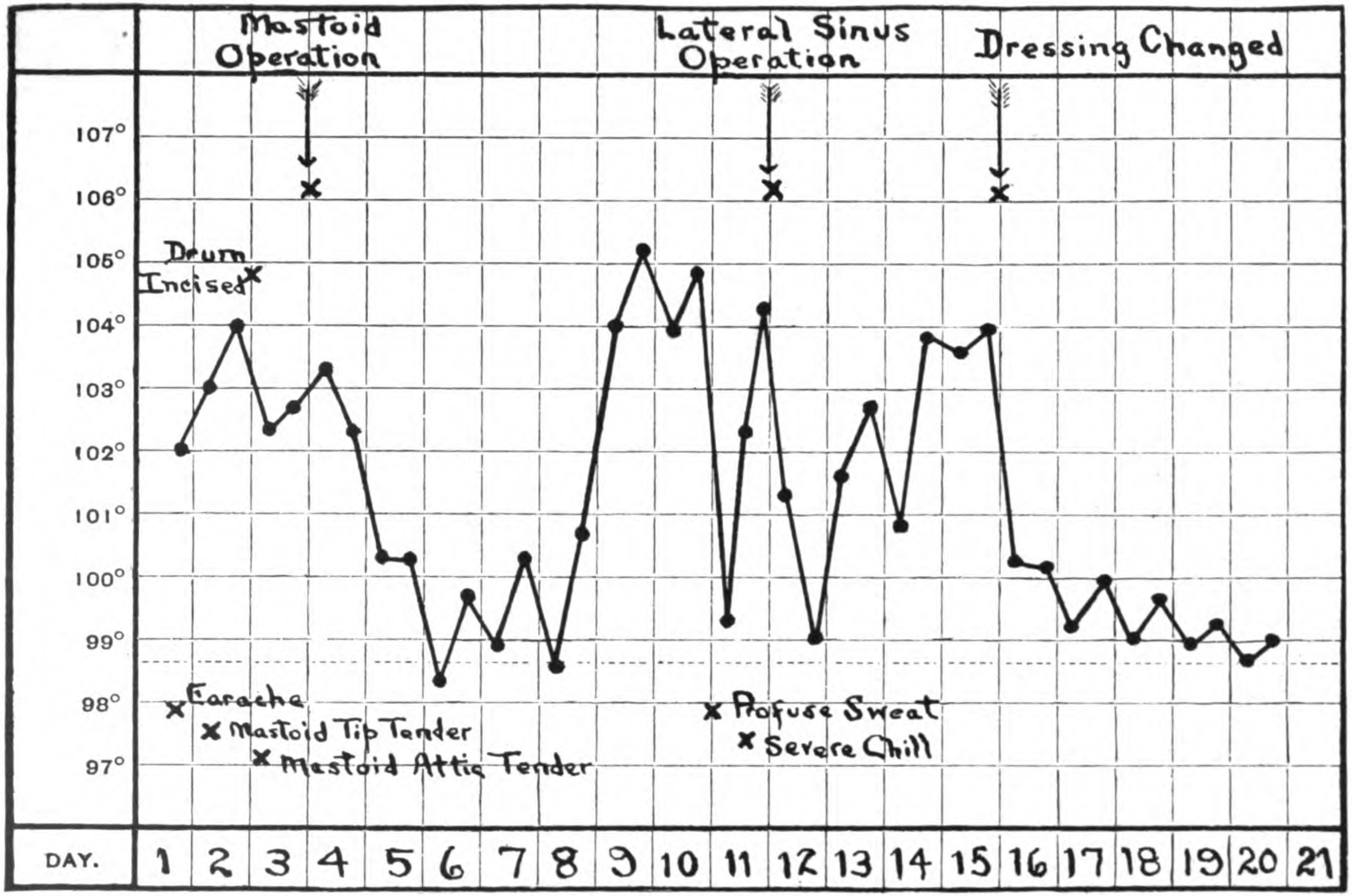
The operative procedures of aural surgery can be mastered by any one and once learned are reasonably easy of accomplishment. The

decision of when to operate on a mastoid, when to open a lateral sinus, when to ligate or exsect the jugular vein, when to trephine for abscess of the brain, when and where and how to drain in the presence of meningitis may often be a difficult decision to make. The rarity of these cases in the naval service, together with the occasional need of meeting them, should be sufficient excuse for reporting a case of mastoiditis complicated by sinus thrombosis, for it is only by careful consideration of the case in point with other cases that we can arrive at a correct solution of a problem presented.

R. E. N., apprentice seaman, Naval Training Station, Great Lakes, Ill. History: While boxing the left ear was struck. A profuse brownish discharge came from the external auditory canal, which on examination showed a granular material but no bacteria. About five days after this accident the discharge was lessening and a large round perforation could be made out in the lower posterior quadrant of the drum. No inflammatory reaction seemed present and hearing was 20/15, 20/15.

Eight days after the accident he sickened with measles and after about a week was as well as usual and discharge from the ear had ceased.

Two weeks after the appearance of the measles rash he was taken with a violent pain in the left ear and had a rise of temperature. The following day temperature was 102°, and there was some mastoid tip tenderness. The next day temperature was 104°, and there was tenderness at the attic region and a bulging of the posterior wall of the external auditory canal. The eardrum could not be clearly seen because of swelling of the canal. The eardrum was twice incised this day. No discharge followed except a few drops of watery serosanguineous fluid. Operation having been decided necessary a little time was spent manufacturing a gouge and two chisels of a proper size and shape, an emery wheel and some scrap steel serving the purpose very well. Under ether anesthesia, through the usual curvilinear incision ¼ inch behind the auricle, the mastoid region was bared of periosteum, the suprameatal triangle recognized, the mastoid process chiseled and gouged away until its external table of bone was removed, from the temporal ridge to the mastoid tip and from the posterior bony wall of the external canal to the region of the lateral sinus. The mastoid tip was then removed and attention turned to opening the antrum. With the chisel gouge and curette directed upward and inward and never downward and forward the antrum was opened and a bent probe finally introduced into the attic and middle ear. All the mastoid cells were then scraped and gouged away and the long posterior wall of the external auditory canal chiseled down until it became about one-half its original size. No zygomatic cells were found. There was pus in nearly every mastoid



TEMPERATURE CHART, CASE OF LATERAL SINUS THROMBOSIS.

cell, and in the tip was a cell almost large enough to hold the tip of one's little finger full of pus.

For five days after the operation an uneventful recovery was anticipated because the temperature became normal, the wound drained well and looked clean, the patient was hungry and wanted to get up.

The morning of the sixth day following the mastoid operation the patient's temperature jumped to 104°, pulse 120, respiration 26, and it remained between 104° and 105° for the next 24 hours. Meningitis was feared, but as the day wore on and no vomiting or headache or mental clouding appeared the likelihood of this complication became less and that of sinus thrombosis more.

The seventh day following the operation showed the patient at times cyanotic and dull, at others of good color and bright. The temperature and pulse were as follows:

12 m., temperature, 105°; pulse, 118; respiration, 30.
4 p. m., temperature, 104°; pulse, 126; respiration, 28.
8 p. m., temperature, 105°; pulse, 122; respiration, 28.

There were no chills and no sweats, though these signs were looked for with great care. The leucocyte count taken before mastoid operation was 13,000, after operation 9,000, now 8,000, polymorphonuclears 87.5, mononuclears 12.5. In the night a profuse sweat occurred followed by a drop of temperature at 8 a. m. to 99.4°, pulse 96, respiration 22, with a marked improvement in condition of the patient. During this lull in the storm of the patient's fever preparations were made for opening the lateral sinus should he have a chill and recurrence of his fever. After about eight hours of low temperature and comparative comfort, at 4 p. m. there was a severe shaking chill and cyanosis followed by a rise of temperature to 104°, pulse 128, respiration 26. As soon as he reacted from his chill and became less cyanotic he was taken to the operating room and under ether the original incision was extended directly backward about 3 inches and the bulge of the lateral sinus recognized. This was chiseled away very slowly and carefully till the sinus came to view. Beneath the bone was pus and the sinus wall was abnormal in appearance. With a rongeur bone was next removed from the sinus upward and backward a distance of 3 inches and downward to level of jugular bulb until normal sinus wall could be seen above and below the diseased area. Small wicks of one-half inch gauze were now prepared and placed in position above and below to control the hemorrhage and the sinus was opened well above the diseased area. Sharp bleeding occurred from above and was controlled by the upper pack. As the scissors were carried downward through the diseased portion of the sinus there was a sudden gush of blood from below and the lower pack was adjusted. The incised sinus wall was then packed with

gauze and this led out of the wound at a point different from the two pieces of gauze which controlled the hemorrhage; another piece of gauze drained the mastoid cavity and a dressing covered the whole. The day after the second operation the temperature became 99°, pulse 86, respiration 20. During the four days following the operation there was a rise of temperature to 104°, but pulse did not rise as high in proportion and the leucocyte count was higher than at any time (13,400). On the fourth day it was considered safe to remove the packs and following this dressing the temperature fell and the patient went on to a rapid and uneventful recovery, the wound being practically healed the fifth week after this operation. Hearing five weeks after operation was 20/15, 20/15.

TWENTY-TWO CASES OF POISONING BY THE SEED OF JATROPHA CURCAS.

By J. A. Randall, passed assistant surgeon, United States Navy.

On June 30, 1913, a draft of marines was received at Cavite from the Army transport. These men were destined for Olongapo and were held over at Cavite awaiting transportation. They were temporarily quartered in Fort San Felipe.

During the afternoon several of these men reported at the dispensary with symptoms of an irritant poison. There were intense abdominal pain, nausea, vomiting, and purging. Some of the patients were in a state of collapse.

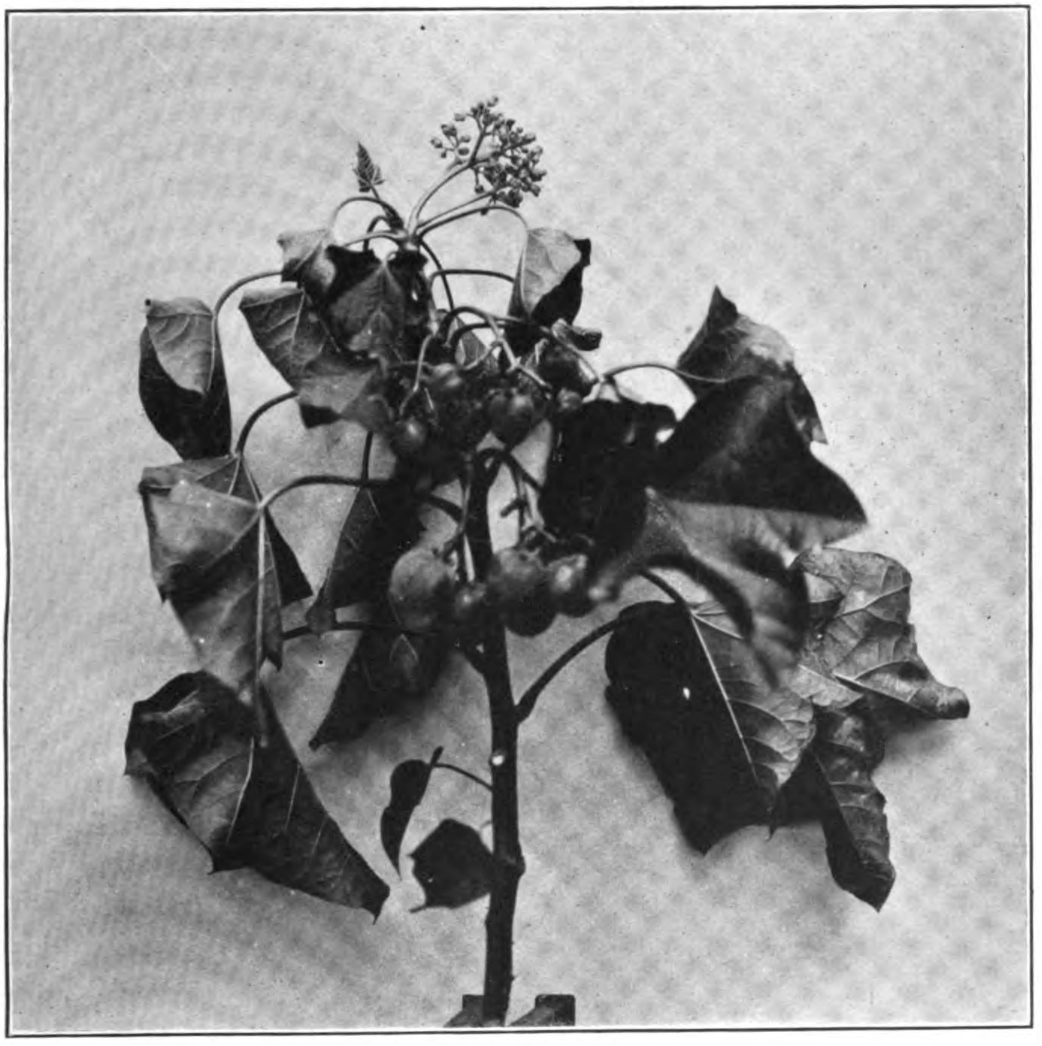
On inquiry it was discovered that they had been eating the seeds of a tree growing in Fort San Felipe.

The medical officer then inspected the draft and found a number of men who had eaten these seeds and presented symptoms of varying intensity according to the number of seeds eaten. The cases in collapse had eaten from 6 to 10, while the milder cases had eaten from 1 to 4.

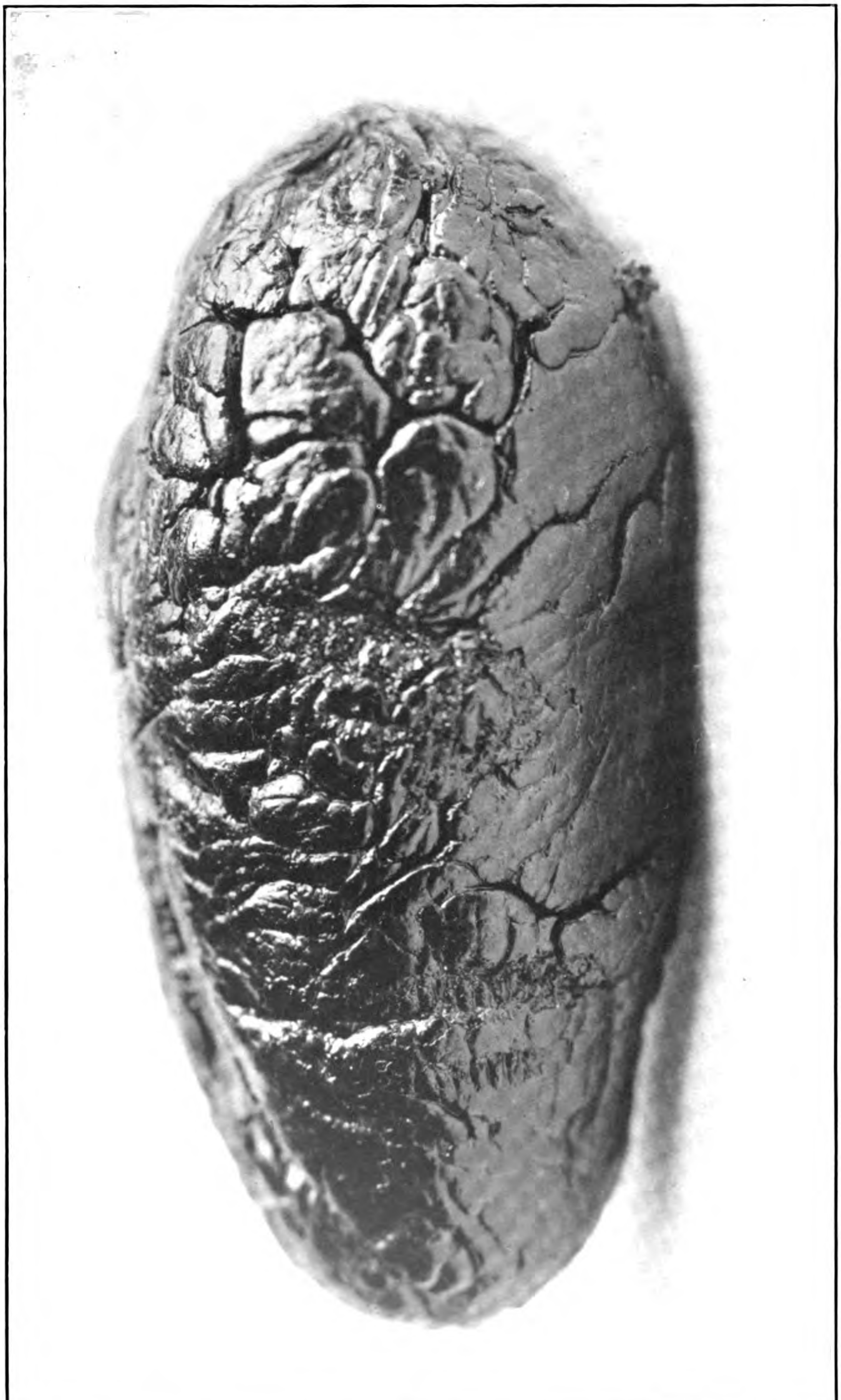
In all, there were 22 cases, 7 of whom were in a state of collapse. They were all treated with emetics followed by castor oil and were all sufficiently recovered the next morning to make the trip to Olongapo.

The tree from which these seeds came is called "tuba" by the natives and was identified as *Jatropha curcas* (fam. Euphorbiaceae). It grows throughout the Tropics and is very common in the Philippines, where it is used considerably as a hedge. The seeds are known as Barbadoes nuts or physic nuts.

Editor's note.—The following cases, similar to those described above, were reported by Asst. Surg. R. J. Farquharson, United States Navy, in the American Journal of the Medical Sciences, July, 1850. (Quoted in Wilson's Naval Hygiene.)



JATROPHA CURCAS.



BALL OF SHELLAC FROM STOMACH. $3\frac{7}{8}$ X $2\frac{3}{8}$ INCHES.

Two men of the United States schooner *Taney*, being on shore at Porto Praya, Cape de Verde Islands, tasted the seeds of the *Jatropha curcas*, which grows abundantly on these islands, and, finding them pleasant, ate of them—one to the extent of a handful, the other being satisfied with three or four seeds. In both cases vomiting and purging of a violent character came on in the course of an hour, and in the case of the man who ate but few the effect went no further. In the other case alarming symptoms supervened; the muscles of the extremities were contracted by violent spasms; the patient was affected with dizziness, vertigo, and great restlessness; the respiration was quick and panting; the skin became cold and moist; and the pulse small, thready, and intermittent. The heart's action was very irregular, and so weak that its impulse could with great difficulty be perceived. These alarming symptoms continued for several hours. After about five hours of assiduous attention, reaction occurred and he fell asleep. The next morning he was nearly well. The seeds were ripe and of the kind used by the inhabitants as an active purgative

SHELLAC BOLUS IN THE STOMACH IN FATAL CASE OF POISONING BY WOOD ALCOHOL.

By H. F. HULL and O. J. MINK, passed assistant surgeons, United States Navy.

The patient was brought to the sick bay at 12.05 p. m., from the U. S. S. *Raleigh*. He stated that for three or four days he had been drinking freely of "Quinine Hair Tonic," but had not taken any since the morning previous. He began to feel badly about 24 hours before coming to the sick bay, but had no acute pain until about an hour before.

The pain was located in the abdomen and back, especially the latter. It was so severe that he was continually writhing and crying out in agony. He complained of being unable to see objects clearly, and that everything was getting hazy.

He was transferred to the hospital at once, but died at 1.20 p. m. Respiration failed first. Artificial respiration by means of the pulmotor was instituted, and kept up until the heart stopped.

At autopsy intense congestion of all organs was present, especially the stomach, intestines, spleen and kidneys. The ball of shellac shown in the figure was found in the stomach.

Among his shipmates the patient had been considered as a man who habitually drank everything suspected of containing alcohol. He had formerly obtained his alcohol from solutions of shellac, but recently had shown a preference for hair tonic. Samples of the hair tonic used were found to contain wood alcohol.

Points of interest:

1. This hair tonic has been and is undoubtedly being consumed by others.

2. The presence of the large bolus of shellac without symptoms. This condition is said to be not uncommon among painters using spirituous solutions of shellac.

A CASE OF PNEUMONIA COMPLICATED BY GANGRENOUS ENDOCARDITIS.

By G. B. Crow, passed assistant surgeon, United States Navy.

It is now quite customary to regard lobar pneumonia as a general pneumococcus infection, with the lesion in the lung as but one of the manifestations. The pneumococcus can be recovered from the blood in a very large percentage of cases, many workers reporting up to 100 per cent of positive findings. The highest percentage of positive blood cultures is obtained in the early stage of the disease. Rosenow's reports show that the pneumococcus may be found in the blood before physical signs are evident, thus indicating that the lung changes are secondary to the septicemia; and although in the majority of cases the gross pathological changes are confined to the lungs, we should not forget in the treatment of these cases that the disease is a systemic infection, that the whole organism suffers from toxemia, and that gross pathological changes may be present in other vital organs. And while such conditions as endocarditis and arthritis occurring in pneumonia are commonly spoken of as complications, it is well to remember that they are only other local expressions of the same generalized infection that focuses attention most often on the lungs.

The following case illustrates some of the local expressions of this systemic disease:

A. R., H. S., U. S. N., aged 50, was admitted to the naval hospital, Philadelphia, January 20, 1913, with well-marked physical signs of consolidation of the upper lobe of the right lung. There was dullness on percussion, increased tactile and vocal fremitus, and marked tubular breathing with many crackling and moist rales. There was a frothy, blood-tinged sputum which in stained smears showed many Gram positive encapsulated diplococci corresponding in morphology to pneumococci. Temperature was 102°, pulse 104, respirations 26. The second cardiac sound was somewhat less pronounced than normal; there were no murmurs. The pulse was easily compressed; the face was flushed and at times almost blue; and altogether the patient presented the appearance of being extremely ill. The patient was placed in an open room protected from drafts, the bowels were opened with castor oil, and a diet was ordered consisting of liquids, eggnog, a small amount of minced chicken and toast, and orange juice. The course of the case is indicated by the following notes and extracts from the health record:

January 22. Middle lobe also involved. Condition, poor. Pulse, 116–120, and of poor volume. There is a red edematous area over the right elbow posteriorly, presenting the appearance of a localized infection. The right cheek is very red; pupils much contracted. In response to questions the patient states that he has been a morphine habitue for several years, and it is probable that he had some of the drug in his possession on admission to the hospital.

January 24. Lower lobe also involved. There is slight delirium. The reddened area over the olecranon is disappearing. The apprentice states that a similar reddened edematous area was present over the left patella yesterday. The bowels are kept open and morphia is given in small doses.

January 26. General condition about the same as at last note. The temperature ranges irregularly from 99.5° to 102.5°. A large quantity of rusty mucopurulent sputum is expectorated. Pneumococci abundant.

January 28. Much improved. Temperature has come down by irregular lysis to normal. Patient is mentally clear.

February 4. Able to sit up in bed. On soft diet. Feels well. General appearance excellent.

February 8. On the evening of the 5th the temperature suddenly rose to 100°, slightly higher on the evening of the 6th, and yesterday evening to 102°. On each occasion the rise was accompanied by severe rigor, and was followed by sweating and an immediate drop to normal. The patient complains bitterly of pain in several joints, especially of the upper extremities, and in the long bones of the legs. He has complained of some pain in the shoulders for about 10 days, but little attention was at first paid to it, as it was thought to be most likely a manifestation of morphinism, although the patient has not asked for the drug during convalescence. The physical signs indicate that the lung is slowly returning to normal. The breath sounds are still somewhat harsh, and the normal lung resonance is not yet restored. There is no evidence of fluid in the chest. The heart sounds are somewhat weak; there are no murmurs. During the previous febrile period the urine was concentrated and frequently contained heavy urate deposits with a few crystals of uric acid; it now contains a large amount of albumin and many granular casts. There is no pus or blood. The patient states that he had malaria five years ago. The blood has been examined several times during the past three days for parasites, but none were found. Leucocyte count, 10,000.

February 13. During the first half of every night there is a very severe chill with a rise of temperature to 103°–104° and followed each time by profuse sweating and a sudden drop to a little below normal temperature. The joint pains continue. The right wrist shows a slight boggy swelling. Pressure over the right tibia produces excruciating pain. No heart murmurs. No evidence of fluid in the chest. Leucocyte count, 13,000, with 85 per cent polymorphonuclears, 11 per cent lymphocytes, and 4 per cent transitionals. Quinine hydrochlorsulphate is being given in 8 gr. doses t. i. d., although the blood has continued negative for malarial parasites. Blood drawn for culture to-day.

February 15. The symptoms continue. I have never seen rigors quite so severe as those accompanying the nightly rise in temperature in this case. The pneumonic condition has not completely resolved. There is also harsh breathing over the left apex. The blood drawn for culture on the 13th shows a gram positive diplococcus morphologically like the pneumococcus, which grows well on blood media and poorly on plain agar. It occurs sometimes in chains. There are no animals available for inoculation.

February 19. The chills have ceased, but the toxemia is increasing. Respirations are rapid and noisy. There is slight delirium, a septic temperature, and frequent profuse sweats. The pulse rate is 110–120. The heart sounds are weak; no murmurs are head. A vaccine was prepared from the organism recovered from the blood, and the patient was to-day given a subcutaneous dose of 20,000,000 of the killed bacteria.

February 21. For two days the temperature has ranged from 100° to 104°. Patient is delirious and so noisy that physical examination of the chest is

impossible. There is marked abdominal distension, ptosis of the left eyelid, and a weak, rapid pulse. Patient is receiving stimulation.

February 22. Patient died in coma at 12 noon to-day.

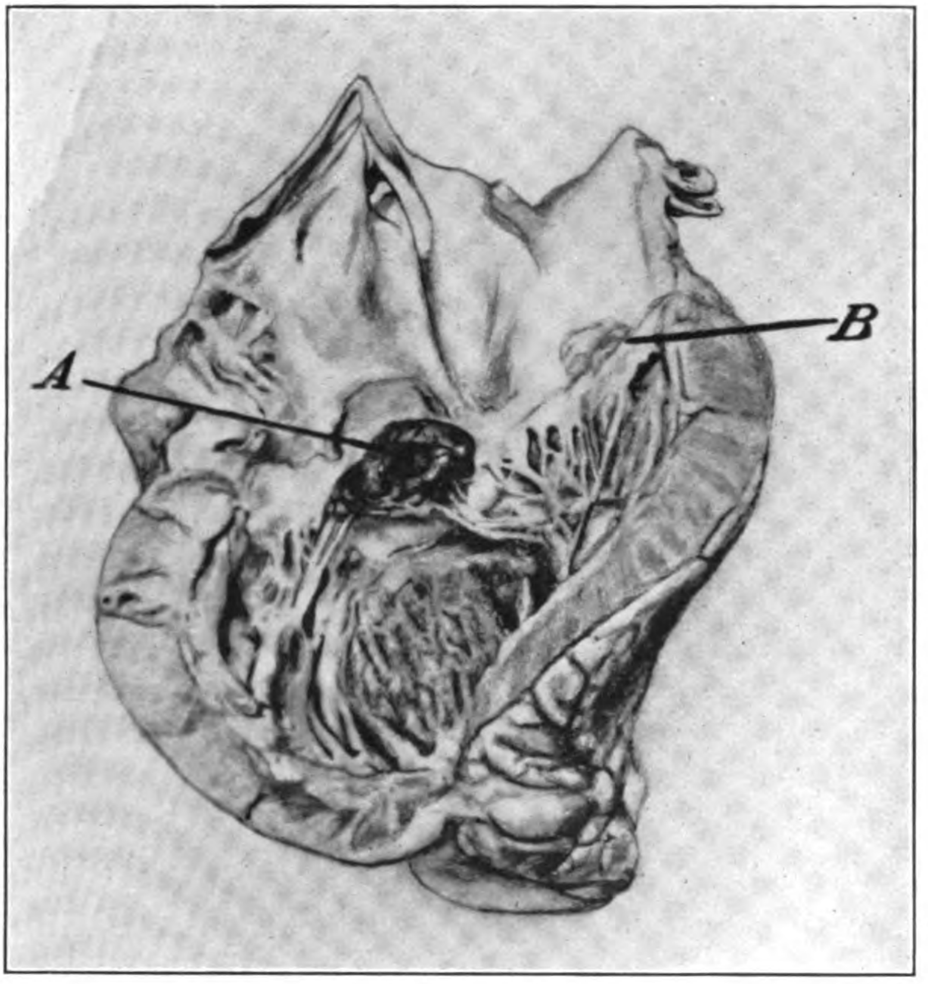
Autopsy: Only the abdomen and chest were opened. The stomach and intestines were distended with gas. The pleural cavities did not contain free fluid. The left lung showed moderate hypostatic congestion. The right lung was semicollapsed and slightly adherent posteriorly to the chest wall. There was no plastic exudate. Slight hypostatic congestion. The lung felt and cut somewhat more resistant than normal lung, due evidently to the presence of some recently formed and pretty evenly distributed fibrous tissue—incomplete resolution. No abscess was discovered.

The pericardial sac contained about 5 c. c. of clear fluid. There was a moderate amount of external fat on the heart. The heart was normal in size. The cavities contained some dark fluid blood, the right heart alone being very slightly distended. The muscle was slightly paler than normal. The tricuspid and semilunar valves were normal. The auricular surface of each cusp of the mitral valve presented a large vegetative growth. The size and appearance of these growths are well shown in the accompanying photograph. The growth marked B was white and firm and its surface presented a typical cauliflower appearance. It measured about 1.5 cm. in diameter and was situated near the center of the upper surface of the leaflet. The growth marked A was brownish black in color and was gangrenous. A slough had already occurred, leaving a moist ulcer. This growth measured a litle more than 2 cm. in diameter; it was situated on the upper surface and extended up to the free margin of the leaflet.

It appears altogether probable that the endocardial growths, the reddened skin areas, and the swollen and painful joints were localized foci of pneumococcus proliferation. The ptosis of the eyelid might suggest a beginning basilar meningitis.

According to the figures collected by Norris (Modern Med., Vol. I, 2d. ed.) acute pneumococcal arthritis occurs in 0.5 per cent of lobar pneumonias. His figures indicate that acute endocarditis is diagnosed in 0.44 per cent of cases, and autopsies on fatal cases show endocarditis in more than 5 per cent of cases. This is good evidence that most cases of endocarditis are overlooked. The diagnosis of endocarditis was not made before death in the case above reported. The noisy delirium preceding death prevented auscultation of the chest during the last three days, but the condition had evidently been present longer than three days. I believe that the absence of auscultatory signs can be explained by the location of the growths. Both were entirely on the auricular surfaces of the leaflets. The growth on the left leaflet did not approach the edge of the valve at any point; that on the right did reach to the free margin of the leaflet at one point, but did not extend beyond the margin. The valve closed perfectly and there evidently was no leakage. The valve ring was not stretched. We might expect a presystolic murmur from such a lesion, but this was not made out.

The most striking point in connection with this case is the onset of pneumococcic sepsis after convalescence from the lung condition appeared well established.



A.—GANGRENOUS GROWTH ON THE RIGHT MITRAL LEAFLET (NOTE THE ULCER). *B*.—GROWTH ON LEFT LEAFLET.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

A. W. Dunbar, surgeon, and G. B. Crow, passed assistant surgeon, United States Navy.

Ahrens, Dr., Marine-Stabsarzt. **Über Lähmungsirresein in der Kaiserlichen Marine wärhend der Jahre 1901 bis 1911 unter Stellungnahme der Dienstbeschädigungsfrage. (On progressive paralysis in the Imperial Navy during the years 1901–1911, including considerations of the possible additional damaging influences exerted upon the course of the disease by the conditions peculiar to the naval service.** Veröffentlichungen a. d. Gebiete des Marine-Sanitätswesens, herausgeg. v. d. Medizinal-Abt. d. Reichs-Marine-Amts. Mittler u. Sohn, Heft 7, 1913, Berlin.

By the most patient and laborious research work of following up the tortuous channels of information, both private and official, Dr. Ahrens has succeeded in accomplishing the somewhat heroic task of tracing and collecting the detailed histories of 96 cases of this disease, which occurred in the Imperial Navy during a period of 10 years, and thus he has presented to us an old and hidden source of damage to the service under the new light of the more recent scientific research.

Progressive cerebral paralysis is one of those few mental disorders that has a well recognized organic basis, developing, as it does, in direct sequence of a preceding syphilitic infection. This form of paralysis usually ends fatally in three or four years from the date of the appearance of decided symptoms. Its dangers to the service from a social and military point of view arise, more especially, from the facts that (1) it goes unrecognized in its early stages, and (2) it affects men in the prime of life, occupying positions of great responsibility, and consequently involving an immense and incalculable amount of possible moral as well as material damage.

The line-of-duty question, as is well known, is a most difficult one—as well as an unsettled one—in every service, but ought, nevertheless, to be faced squarely and courageously. Since it is assumed that but 2½ per cent of all syphilitics end in progressive paralysis, it may well be further assumed that a number of other factors must enter in the production of this terminal form of a syphilitic infection. Injuries to the head, mental strain, great excitement, the influence of great heat, strong electric current and alcoholism have

been accused. It is interesting to note that in most every one of the 96 cases in which the line-of-duty question was raised, a benign decision was rendered on the part of the medical officers and in no case was a pension refused on account of the etiology of the disease; this position seems to us as liberal, generous, and just as it is profoundly logical.

The reviewer, further, agrees with the author in assuming that the probable percentage of syphilitics who, later, develop into paralytics, is higher in the naval service than in civil life or even in the Army. The age of the sick, in most cases, falls into the fourth decade, averaging 37 years. It will perhaps be further conceded without discussion that the opportunities for a syphilitic infection in the naval service are very great. In the seaports of all parts of the world venereal diseases are widely disseminated. In spite of the preventive measures that have been introduced the admissions are still numerous. The conditions in foreign ports are such that sexual intercourse can not be had under the same precautions as at home. It is even supposed that a specially malignant course on the part of a syphilitic infection points to a foreign origin of the original infecting agent. The reviewer is inclined to believe that personal physical conditions and the changes which these must and do undergo under the influences of the ever changing local and climatic changes incident to the service (allergy, Umstimmung) may have as much to do with a rapid and malignant course of the infection as any particular virus to which the disease owes its origin.

A perusal of the histories of these 96 cases of progressive paralysis will be found interesting and most instructive reading. The author's work shows that there is much useful research work to be done in the service even outside the walls of bacteriological laboratories.—(H. G. BEYER, MEDICAL DIRECTOR, UNITED STATES NAVY, RETIRED.)

BUNTING, C. H., and YATES, J. L. **An etiological study of Hodgkin's disease.** Journ. Amer. Med. Assoc., Nov. 15, 1913.

Bunting and Yates report the finding of a diphtheroid organism in four cases of Hodgkin's disease in a pure culture, and present in three others. Repeated inoculation of a monkey with a vaccine of this organism produced changes in the lymph glands and the blood characteristic of incipient Hodgkin's disease, such as chronic lymphadenitis with atypical proliferation of the stroma tissue, eosinophilic infiltration and periglandular sclerosis.

The blood changes were, an absence of the polynuclears following the injection; an increasing percentage of the mononuclear elements, especially of the transitionals; a fall in the eosinophiles followed by

an increase; and an early basophilia. As a result these experimenters feel assured that there is an etiological relationship between this organism and Hodgkin's disease.—(A. W. D.)

BILLINGS, F., and ROSENOW, E. C. **The etiology and vaccine treatment of Hodgkin's disease.** Journ. Amer. Med. Assoc., Dec. 13, 1913.

Billings and Rosenow have confirmed the findings of Bunting, Yates, Negri, and Mieremet who have reported the isolation of a Gram-staining non-acid-fast, polymorphous diphtheriod bacillus. This organism was found in 12 cases of Hodgkin's disease of varying types. In 3 only the bacillus was in a pure culture, in the remaining cases being associated with a staphlococcus, this latter however is probably derived from the bacillus.

The organism was obtained from the lymph nodes, and a vaccine prepared and administered in increasing doses from 5 to 100 millions.

There is a febrile reaction with rapid pulse, weakness and general muscular aching following this treatment.

The results have been encouraging even where this specific treatment was administered without the coincident use of the X-ray.—(A. W. D.)

STEELE, A. E. **Corynebacterium hodgkini in lymphatic leukemia and Hodgkin's disease.** Boston Med. and Surg. Journ., Jan. 22, 1914.

Steele reports the isolation of an organism in two cases of Hodgkin's disease which was apparently identical with the bacillus reported by Bunting and Yates and others, and believed to be causative of the disease.

This organism is markedly pleomorphic. It usually resembles the diphtheria bacillus, but is sometimes short and coccoid. It is not acid-fast, is resistant to antiformin, and is Gram positive.—(A. W. D.)

ADAMI, J. G. **Chronic intestinal stasis. "Autointoxication" and Subinfection.** Brit. Med. Journ., Jan. 24, 1914.

This is a stinging criticism of the growing tendency, with Sir Arbuthnot Lane as its chief advocate, to ascribe so many grave disorders to derangement of the intestinal tract. Lane has enumerated 17 conditions or groups of symptoms which he believes result directly from the autointoxication of intestinal stasis. A few of these are: Mental conditions, melancholia, imbecility, rheumatic pains in the muscles, joints, etc., atrophy of the thyroid gland, degenerative changes in the breast predisposing to cancer, Bright's disease. He enumerates nine other diseased conditions indirectly resulting from

"autointoxication," and states that these are only a few of the more obvious. These include tuberculous infection other than that due to direct skin inoculation, infections of the genito-urinary tract, ulcerative endocarditis, etc. He ascribes these disorders primarily to delay of fecal material in the large bowel. He believes that this delay in the passage of the intestinal contents results in the production and absorption of toxic materials in such amounts as to produce degenerative changes in every tissue of the body. To remedy this he advocates short-circuiting the bowel or even removal of the colon.

Commenting on this list of disorders ascribed to intestinal "autointoxication," Adami says: "It is a portentous roll—a roll so long that we may well call a halt and examine into its details." The term "autointoxication" was first popularized through the publication of Bouchard's lectures in 1887. Since that time this term has become a blanket to cover ignorance, and the users have confused together many processes which for the purposes of clear thinking and progress should be kept carefully apart. Adami considers two questions. First: Granting that by proper means, delay in the passage of the intestinal contents is demonstrated, and that a certain number of Lane's symptoms have appeared; is this sufficient ground for operation? Second: What is definitely known regarding these symptoms and the way in which they are brought about, and can that knowledge be used as a guide in selecting the mode of treatment? Regarding the first, Adami believes that Lane neglects the underlying causes of stasis. Removal of obstructing bands is indicated in cases where radioscopic examination actually demonstrates the existence of such bands, and it is probable that patients may be benefited by the removal of a seriously and permanently damaged colon; but he considers it absurd to remove the colon in such a condition say as pulmonary tuberculosis on the ground that without intestinal stasis we should have no tuberculosis. It would be better to direct attention to improvement of the nutrition and muscular tone of the patient along such lines as are suggested by the underlying condition present. In considering the second question—that is, the nature of the processes set up by intestinal stasis—he states that very little is definitely known. There are three orders of possible toxic substances: (1) The products of disintegration of foodstuffs by the digestive juices; (2) the products of disintegration of foodstuffs by bacterial activity; and (3) the ectotoxins discharged by intestinal bacteria.

As to the first, Adami states that none of the products of digestion have been found capable of producing symptoms resembling even one of the seventeen unless we include the wasting due to faulty digestion and absorption of fats or other foods. As to the second, Woolley and Newburgh found that long-continued injections of indol and tyrosin (substances derived from the aromatic group of

the protein molecule) produce slight possibly harmful changes in the adrenals, and Herter found that headache, mental irritability, and muscular fatigue could be produced by introducing indol into the circulation. The above results represent the one solid fact in the matter of alimentary intoxication, and it is doubtful whether it can be applied to the colon and the serious states that may accompany fecal stasis. Considering the third form of intoxication, namely, by bacterial ectotoxins, it is striking that the most prominent intestinal bacteria—the *Bacillus coli* group and the streptococci group—produce no recognizable ectotoxins. The very large number of dead bacteria present in the feces is contrary to the theory of intestinal bacteriolysis, and, too, according to Vaughan's recent work, if these bacterial split proteins were present and absorbed they would set up symptoms similar to those caused by the absorption of peptones and proteoses, namely, anaphylaxis, and not symptoms attributed to fecal retention. There are two recognized toxin producers that may occur in the bowel, the *Bacillus botulinus* and the *Bacillus pyocyaneus*. The former occurs rarely and the latter more commonly. When the toxins of these organisms are absorbed in sufficient quantity, symptoms may develop; but these symptoms are chiefly confined to the nervous system.

Summing up, Adami finds little evidence in favor of the intoxication theory. He criticizes Lane's case reports in that the cases had not been carefully worked up from the standpoint of diagnosis. In a few of these cases Lane noted that *Bacillus coli* or streptococci were found on blood culture. Adami believes that if further studies had been made in these cases a similar finding would have been made in so many cases that Lane would have attributed most of the disturbances he tabulates to a low-grade infection rather than to "autointoxication."

Adami concludes as follows:

1. It is more rational to regard the evil effects of intestinal stasis as, in the main, a result of conditions favoring subinfection and low forms of infection than as a result of chronic intoxication.

2. The term "gastrointestinal autointoxication" is pernicious and not to be employed by any self-respecting member of our profession, save for so limited a set of conditions that for ordinary purposes it may safely be wholly expunged from the medical vocabulary.

3. While the symptoms and diseases enumerated by Sir Arbuthnot Lane may follow intestinal stasis, at least a large proportion of them may originate independently of such stasis.

4. Before recommending the operation of short-circuiting it is necessary, therefore, to make the fullest studies so as to discover, if possible, the nature of the organism responsible for the disturbance and its probable seat of entry.

5. A discovery of the cause of the symptoms is calculated to suggest the appropriate treatment by means other than short-circuiting. Only when these have been tried and found wanting is removal or short-circuiting of the colon justifiable.—(G. B. C.)

CRAIG, C. F., and NICHOLS, H. J. **Studies of syphilis.** Bulletin No. 3, War Department, Office of the Surgeon General.

Only a few points can be referred to in a review of this very valuable bulletin. A careful study of the entire bulletin is recommended. Except for an introduction by Russell, the entire text is written by Craig and Nichols and is arranged under the following chapter headings:

I. The *Spirochaeta pallida.*

II. The specific diagnosis of syphilis.

III. The diagnosis of syphilis by the complement fixation test.

IV. The influence of treatment with salvarsan upon the complement fixation test for syphilis.

V. A serological study of syphilitic relapses following treatment with salvarsan.

VI. Symposium on the results of salvarsan therapy in the Army.

VII. Nervous relapses.

VIII. The cure of syphilis.

The provocative Wassermann reaction is one of the most valuable diagnostic means discussed. Gennerich first called attention to the value of this test in the diagnosis of syphilis, especially of latent cases, and as a means of determining whether or not a cure had been effected. He found that in many treated cases in which the Wassermann reaction had been repeatedly negative the provocative test was frequently positive, thus showing that the cases were not cured. The test is based on the principle of the Herxheimer reaction; that is, an exacerbation of the symptoms of syphilis immediately following a dose of salvarsan. In the provocative test the Wassermann test is made two to four days following the administration of a dose of salvarsan.

Following are a few of the conclusions in these studies:

The Wassermann reaction has proven of great value in the diagnosis of suspicious cases, and is the most accurate method we possess of controlling the treatment of syphilis with either salvarsan or the mercurials.

The reaction disappears most rapidly in cases treated during the primary stage.

The complement fixation reaction disappears more rapidly after the intravenous administration of salvarsan than after the intramuscular administration, but the latter gives a somewhat higher percentage of final negative reactions. It appears that three or four intravenous injections are necessary to cause a disappearance of the reaction in from 70 to 80 per cent of patients.

A larger proportion of negative results were obtained in patients previously treated with mercury than in cases not so treated, but the time of the disappearance of the reaction was little affected.

One intravenous injection of 0.6 gm. salvarsan has practically no curative value, for it has been found that 97 per cent of cases so treated have relapsed. In cases given two intravenous injections there have been 82 per cent of relapses. One intramuscular injection appears of more value than two intravenous injections considered from the standpoint of relapses.

Intense mercurial treatment should be combined with salvarsan.

In order to cure syphilis we must have a standard of cure. The following is recommended as a standard: One year without treatment, without any suspicious clinical signs, with several negative Wassermann reactions and with no positive ones, and with a negative provocative Wassermann reaction and luetin test at the end of the year.—(G. B. C.)

WILLSON, R. N. **The treatment of the pneumonias.** Journ. Amer. Med. Assoc., Jan. 24, 1914.

Willson emphasizes two points—the necessity for discrimination in the type of cases to be given the cold-air treatment, and the intimate relation existing between intestinal disturbances and irritation of the respiratory tract.

In considering the applicability of the cold-air treatment he divides pneumonias into two types. To the first belongs lobar pneumonia, coming on often in a previously healthy person ("though many times in a tired, overfed one") and usually characterized by a vigorous reaction to the infection. These cases do well on cold-air treatment. Over against this he places the second type, to which belong the bronchocatarrhal pneumonias, occurring usually in patients of such low vitality that there is little or no reaction to the infection. The clinical course is one of low, irregular temperature, usually a weak, rapid pulse, a respiratory rate not much above the normal, often a bloody sputum, and terminating most frequently in a long-drawn-out recovery or death. For this type of pneumonias Willson strongly condemns the cold-air treatment. Let them have fresh air, but have it warm. The conservation of the vital forces must be the main objective. Cold air not only causes a loss of heat and energy directly, but it generally causes in these patients extreme irritation of the respiratory passages. This is manifested by persistent coughing, which still further reduces the patient's strength.

Regarding the other point, Willson says: "I have become more and more thoroughly convinced that the great number of bronchitides find their origin in toxemias arising from the intestinal tract." He therefore advocates in both types a thorough initial cleansing of the intestinal tract and the repetition of this procedure every second day during the course of the disease. He considers castor oil as by far the best agent for this purpose.

After considering various other therapeutic measures, the author adds a warning which should not be, but nevertheless is, a very necessary one: "Every measure, even the administration of food, which interferes with the patient's rest of mind and body, especially with sleep, should be interdicted as certain to produce harm. There is no question as to the fact that many pneumonia patients are hurried, if not helped, into the grave by overtreatment."—(G. B. C.)

FRIEDLANDER, A. **Whooping cough: Etiology, diagnosis, and vaccine treatment. A review of recent literature.** Interstate Med. Journ., Jan., 1914.

Inaba, in 88 cases examined, found the Bordet-Gengou bacillus 78 times, and in 88 per cent of these the bacillus was grown in pure culture. In 18 cases of disease of the upper respiratory tract clinically not pertussis the bacillus was never found. Inoculation of apes with the bacillus produced typical cases of pertussis.

Mallory and Horner found a minute bacillus, like that described by Bordet and Gengou, in large numbers between the cilia of the epithelial cells lining the trachea and bronchi, and they believe that the symptoms of pertussis are largely due to mechanical interference with the action of the cilia.

Delcourt, during an epidemic of pertussis, found the complement fixation test of great value in diagnosis, especially in atypical cases. He presumably used the Bordet-Gengou bacillus as antigen.

Dobeli believes that pertussis is not a disease, but that it is merely a symptom-complex occurring in neuropathic individuals; in other words, that the affection is purely psychic. Freer and Czerny point out that pertussis frequently occurs in nursing infants who have never heard attacks, and that in such cases the condition could not be psychic in origin. It is probably true, however, that neuropathic children have more severe attacks than normal children.

Morse calls attention to the seriousness of whooping cough as a factor in child mortality. In 1910, according to the United States Public Health Reports, the death rates per 100,000 were: Whooping cough, 11.4; diphtheria, 3.4; scarlet fever, 11.6; measles, 12.3.

Treatment: Quinine retains its place, and its value is attested by many observers. Vaccine therapy is now receiving much attention. Nicolle and Conor used a vaccine made from the Bordet-Gengou bacillus in 104 cases. The vaccine was given subcutaneously in doses of from 400 million to 2 billion. They report that 35 per cent were cured, 38 per cent greatly improved, and 26 per cent not affected. In the cases cured the improvement was rapid, usually after the second inoculation. Klimenko reports good results in a series of 35 cases. Bamberger treated 6 cases giving 20 million bacteria every second day. He did not consider the attacks greatly shortened but did find the severity lessened. He suggests that larger doses might give better results. Zahorsky has advocated larger doses. Sill reports 33 cases treated with vaccine. No ill effects were noted in any case. In all cases the number and severity of paroxysms were lessened, although in many cases the duration of the disease was not shortened. He advises average doses of 50 million every other day. He has used the vaccine in a small way as a prophylactic in exposed cases, and this may prove its greatest field.

(Reviewer's note: Ruhrah, in the latest edition of "Modern Medicine" says: "A vaccine has been prepared from the Bordet and Gengou organism, but so far the results have not been very satisfactory. Several curative serums have been tried without results.")—(G. B. C.)

SPITZIG, B. L. **A new and logical treatment for alcoholism.** Journ. Amer. Med. Assoc., Jan. 17, 1914.

In a long study of the eating and drinking habits of alcoholics the author was impressed by the fact that the confirmed drinker eats little sugar and often shows a positive aversion for it. He uses no sugar in tea or coffee and cares little for pastries or starchy foods. He subsists chiefly upon stimulating foods rich in condiments, and his appetite for drink is thereby increased.

Spitzig considers the chemical relationship between carbohydrates and alcohol significant. Dextrose is convertible to carbon dioxide and ethyl alcohol. The combination of carbon, hydrogen, and oxygen tends to increase nutrition, whether that combination be derived from alcohol or indirectly from sugars and starches. The human organism deprived of sugars demands an increased supply of alcohol, and conversely when the body is satiated with alcohol it has little need for carbohydrates. The moderate drinker often uses sweetened liquors. He assimilates both sugars and alcohol, and his thirst for drink is more easily satisfied. The confirmed alcoholic cares for no sugar and absorbs greater quantities of unsweetened alcohol to satisfy his bodily economy.

Treatment: Chronic alcoholism is treated on the basis of the foregoing proposition—the supply of alcohol is diminished and the sugars are increased. Former systems have failed because when alcohol was withdrawn nothing was substituted to satisfy the craving. The use of alcohol should generally be interrupted by degrees and by the substitution of highly sugared liquors which are rapidly reduced in quantity. Toddies, juleps, and sweet wines are best. The diet should include much cereal, sweet fruit, pastries, chocolates, and ice cream. If the distaste for sugars is so great that the patient rebels at this diet it may be reduced or entirely suspended temporarily, and lactose, in 1-dram doses, given every two hours in the form of a powder.

Capsicum and nux vomica may be necessary during the first week to allay the gastritis, and soporifics may be used to allay nervous manifestations. The urine should be examined frequently in order to avoid breaking down the carbohydrate tolerance. After self-confidence is established in the patient the sugars may be gradually decreased.

The best results are obtained among the intelligent class who have sufficient interests at stake to make their recovery a matter of vital importance, to persevere in their treatment, and to guard against a reversion to former conditions.—(G. B. C.)

HOUGH, W. H. **Intraspinous injection of salvarsanized serum in the treatment of syphilis of the nervous system, including tabes and paresis.** Journ. Amer. Med. Assoc., Jan. 17, 1914.

Noguchi, Nichols, Graves, Levaditi, and others have proven conclusively that paresis is an active syphilitic disease; that living *Treponemata pallida* are present in the paretic brain. Noguchi has also found the parasite in the brain of one case of tabes. The parasites occur generally in the gray matter at some distance from the blood vessels. As salvarsan has less predilection for nervous tissue than for other tissues of the body, it is now easy to understand why the intravenous administration of this remedy has been inefficient in these conditions. When salvarsan is administered intravenously very little or none of it can be demonstrated in the spinal or ventricular fluid. Animal experiments have shown, however, that direct injection of salvarsan into the subarachnoid space is injurious, although it has been shown that substances so introduced do reach the ventricles of the brain and the communicating perivascular and perineural spaces. It is also known that the blood serum of recently treated or cured syphilitics has a marked trophic effect upon *Treponemata pallida* in vitro. Based on these facts, Swift and Ellis, of the Rockefeller Institute for Medical Research, in 1912, devised the following technique for the treatment of these cases:

A dose (usually the maximum) of salvarsan or neosalvarsan is given intravenously in the usual manner. At the end of an hour 50 to 60 c. c. of the patient's blood are drawn by venous puncture, clear serum is separated, diluted to 40 per cent with normal salt solution, heated to 56° C. for half an hour, kept cool until the following day, then warmed to body temperature and injected into the subarachnoid space by lumbar puncture after the withdrawal of about 15 c. c. of spinal fluid, the amount of diluted serum injected being about 30 c. c. The serum must be injected slowly without much pressure, and after the injection the patient must be kept in bed for 24 hours with the head lowered.

The number of treatments must depend upon the condition of the patient, but in general one treatment is given every second week until 8 or 10 have been given; then wait for a time and repeat the treatments if necessary. The Wassermann reactions with the blood and spinal fluid and the cell and protein estimation of the spinal

fluid are the guides to discontinuance of treatment. Mercury and iodide should be used when indicated.

Results: Hough discusses the results of Swift and Ellis; Fordyce, of New York; Myerson, of the Psychopathic Hospital, Boston; Cotton of the Trenton State Hospital; Asper of Baltimore; and reports six cases treated by himself at the Government Hospital for the Insane. Altogether, about 60 cases receiving about 500 doses have been reported, but few have received a sufficient number of treatments to warrant a statement as to the final outcome. Nearly every worker has reported some favorable results. The possibilities of benefit appear somewhat better in tabes than in paresis, although in the latter disease Cotton reports that three of his nine cases were sufficiently improved to leave the institution. The most favorable results are to be expected in the nervous manifestations which occur in the earlier stages of syphilis. Hough concludes: "If we are able to arrest the process in paresis and tabes—and the evidence so far, in some cases, is strongly in favor of this possibility—a marked advance will have been made in the treatment of these hitherto almost invariably incurable diseases."

(Reviewer's note: Those medical officers who were on duty at the Naval Hospital, Philadelphia, during the year ending in July, 1913, will be particularly interested in Hough's case report No. 4.

McCaskey, in the same number of the Journal, reports seven cases treated by this method. Some of his cases have shown remarkable improvement.)—(G. B. C.)

GIBSON, A. G. **On the infective nature of certain cases of splenomegaly and Banti's disease.** Quart. Journ. Med., Jan., 1914.

In the post-mortem examination of six cases at the Radcliffe Infirmary, Oxford, Gibson found by a special method of staining an invasion of the spleen by a streptothrix-like organism. Three of these cases presented the picture of Banti's disease, two had splenic enlargement and fibrosis, and one had splenomegaly. He believes that at least in the three cases of Banti's disease the streptothrix invasion was responsible for the pathological condition present. The organisms were demonstrated by Wheal and Chown's method for staining clubs in actinomyces. It is a double stain, first by hematoxylin, then by carbol fuchsin, the decolorization being effected by equal parts of absolute alcohol and a saturated watery solution of picric acid. A section of spleen thus stained shows dense tangled wirelike masses surrounding the veins associated with the trabeculæ. At the margins of the masses branching irregular threads are seen. These vary greatly in thickness, the thinner ones measuring one-fourth micron. Many show transverse segmentation. Rounded sporelike bodies are

sometimes associated with the threads. From such an area with its vessel in the center dense fibrous bands spread out in every direction to other trabeculæ. In four of the cases studied the organisms stained blue black, in the others they stained red. Gibson is not certain whether these represent two different types of organisms or whether they represent different stages or variations in the same organism. In one case the threadlike growths were also associated with tubercle bacilli in numerous tubercles in the lungs. A number of spleens taken from cases that died from other diseases failed to show any condition resembling the one described. No cultural proof is yet available that these structures are parasites.—(G. B. C.)

BILLINGS, F., and ROSENOW, E. C. **The etiology and vaccine treatment of Hodgkin's disease.** Journ. Amer. Med. Assoc., Dec. 13, 1913.

The work of Billings and Yates may be considered a sequel to that of Bunting and Yates and Negri and Mieremet. The authors isolated an organism corresponding to the one described by the abovementioned workers from 12 cases of Hodgkin's disease, and treated 11 cases with autogenous vaccines prepared from these cultures. One patient is apparently well, 8 are improved, and 2 died. The two fatalities resulted from mediastinal pressure, due to enlarged glands. One of these had received one dose of vaccine and the other had received three doses. X-ray treatment was used coincidently with the vaccines, because it was believed that deprivation of the patients of any and all means of possible benefit was unjustifiable until it is conclusively proven that this microorganism is the cause of the clinical entity called Hodgkin's disease.—(G. B. C.)

BUNTING, C. H., and YATES, J. L. **Cultural results in Hodgkin's disease.** Arch. Int. Med., Aug. 15, 1913.

An etiologic study of Hodgkin's disease. Journ. Amer. Med. Assoc., Feb. 14, 1914.

Sternberg supported the theory that Hodgkin's disease was a manifestation of tuberculosis. Reed and Longcope showed definitely that the condition was independent of tuberculosis. In 1900 Fränkel and Much reported that by a special technique they found in the nodes of 12 out of 13 cases of Hodgkin's disease organisms which they considered nonacid-fast tubercle bacilli.

Early in the year 1913 Negri and Mieremet reported the cultivation from two cases of Hodgkin's disease of an organism which falls within the diphtheria group, and agrees in morphology with the forms described by Fränkel and Much.

In their first communication Bunting and Yates report that in three cases of Hodgkin's disease they obtained in pure culture a diphtheroid organism, which seems to be the same as that reported by Negri and Mieremet. In general the organism appears to grow best on media similar to those employed in the cultivation of the tubercle bacillus. On the cultures from tissue the colonies do not make their appearance for several days. Subcultures grow with greater luxuriance than the original culture. The organism is Gram positive and nonacid-fast. The form varies greatly; in young cultures slender bacillary forms predominate, in older cultures coccoid forms predominate. Clubs are often seen. As a result of repeated cultures the authors feel sure they are dealing with a single pleomorphic organism and not with a symbiosis of coccus and bacillus.

In their second report Bunting and Yates give the results of the inoculation of monkeys with the cultures mentioned above. The animals developed a relatively acute disease with extensive necrosis and leukocytic infiltration of the glands. In one animal the glands gave the histologic picture of Hodgkin's disease. They admit that their animals did not present the chronic lymphnode picture seen in the well-developed case of Hodgkin's disease in man, but they point out that occasionally, even in man, the disease may run a relatively acute course, and they believe that a more chronic course may be developed in monkeys by working out a proper method of infection.

(Reviewer's note: I believe the average reader of these animal autopsy records will be impressed by the similarity of the picture described to that resulting from experimental tuberculous infection.)—(G. B. C.)

SURGERY.

R. SPEAR, surgeon, and R. A. WARNER, passed assistant surgeon, United States Navy.

GIVEN, H. C., Surg., R. N. **Interesting cases of gunshot injury treated at Hankow during the revolution of 1911 and 1912 in China.** Report of the health of the (British) Navy for the year 1912.

Ten hospitals were engaged in Red Cross work; eight, with 1,250 beds, were in the foreign concessions at Hankow; two, with 600 beds, were in Wuchang. About 2,000 dead and 4,000 injured were accounted for by the Red Cross. A notable feature was the number of noncombatants wounded, many being fired upon as a means of rifle practice. Only one foreigner was seriously wounded. The Imperial rifle was of German make, bore 0.275, bullet bluntly pointed.

Head injuries involving the brain.—There were 26 cases, with 5 recoveries. Only 2 recovered without after effects; of the other 3,

one has permanent deafness in the left side; in another the Rolandic area and speech center are permanently damaged; one has permanent mental weakness.

Case 1. An American spectator, the only foreigner seriously wounded. Bullet entered bridge of nose; emerged behind left mastoid; buried itself in scapular muscles. Never lost consciousness, lost hearing on left side, and had complete facial paralysis. Later operation for anastomosis of facial nerve to spinal accessory; result not known.

Case 2. Bullet entered right temple; emerged on vertex in middle line. Was completely paralyzed in left arm and leg; comatose. No comminution of bone at either wound. Suffered loss of memory; suspicion and fear of all who approached him.

Case 3. Antero-posterior gutter fracture of vertex in middle line, brain exposed, bone comminuted, and fragments scattered through brain. Unconscious for several days, but eventually recovered completely.

Case 4. Shot through frontal region from right temple to left side of forehead; much comminution at wound of exit. Retained consciousness and recovered completely.

Case 5. Shot two weeks before admission and had received no treatment. Bullet entered right temporal region; emerged over left ear, passing through both Rolandic areas. Paralysis of right arm and leg; loss of speech. Recovered, except for loss of speech.

All cases which recovered were shot at long range; none developed any cerebral irritation. The high mortality for wounds of brain was due to the fact that much of the fighting was at close range (200–300 yards).

Abdominal injuries.—There were five cases of perforating wounds through the epigastrium, with four recoveries.

Case 1. Shot antero-posteriorly through the epigastrium. Local abscess at wound of entry; no symptoms of peritonitis. Left hospital cured at end of two weeks.

Case 2. Shot three days before admission, bullet passing through epigastrium antero-posteriorly. Stomach empty at time of injury, and no food before entering hospital. Left hospital at end of four days without having developed a bad symptom, wounds healing by first intention.

Case 3. Clean perforating wound through epigastrium. Left hospital quite fit in eight days.

Case 4. Perforating wound of epigastrium, bullet lodged. Left hospital in eight days.

Of wounds through the middle segment, there were 12 cases, with 7 recoveries.

Through the lower segment, there were 12 cases, with 10 recoveries.

Case 6. The only abdominal case opened up in the hospital. Bullet entered 2 inches above center of Poupart's ligament; lodged in ilium. General peritonitis developed. At laparotomy plastic peritonitis, with adhesions, was found; no wounds of gut found. Drained for two days. Left hospital three weeks after operation.

Case 9. Bullet entered below and to left of umbilicus; feces passed by urethra. Recovered within three months.

Wounds of the flanks occurred in nine cases, with three recoveries.

Case 3. Bullet entered below right nipple, passed through liver and ascending colon, exit in lumbar region. No peritonitis, but wasting from short-circuiting of bowel; fecal fistula. Recovering when last seen.

Injuries of arteries.—Case 1. Diffuse aneurism of femoral artery in Scarpa's triangle. Wounds healed by first intention; a week later he returned with immense swelling of inner side of thigh. Artery was tied, sac opened and cleared out. A large clean-cut hole in artery was found. Dry gangrene of leg; amputation. Left hospital in robust health six weeks later.

Case 2. Wound of small artery, outer side of thigh. Hemorrhage under fascia lata and down inner side of thigh along femoral vessels.

Injuries of heart.—Case 1. Antero-posterior perforation of heart, with recovery. Entry in fourth interspace; exit in eighth interspace behind; apex beat in fifth interspace. Pulse never above 100; recovery without complications.

Three other cases of wounds of the heart, with recovery, are noted.

First-aid treatment of bullet wounds and shell wounds.—Many cases of bullet wounds were brought in with entrance and exit wounds tightly packed with ribbon gauze. These always suppurated, often running a long course, the infection spreading along muscle layers. The best results were obtained by painting skin wounds with tincture of iodine and dressing with sterile gauze. Cotton wool prevents evaporation, keeps the wound moist, and favors sepsis; gauze used alone gives better results. The percentage of infected bullet wounds was greater after the padded winter clothing was worn in the later period of the war.

Shrapnel wounds were almost invariably septic, the large pellets carrying in bits of clothing. The best results were obtained by keeping the track of the bullet well open.

Shell wounds accounted for most of the severe superficial wounds; when not accompanied by injuries to bones or vital parts they generally healed well. First aid consisted in painting the whole wound

and surrounding skin with iodine solution and then dressing with sterile gauze; in the hospital hot douches of salt solution or weak potassium permanganate were found beneficial. In late stages the injection of 1 per cent iodine into suppurating cavities and its application on foul surfaces were found to be of value.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

OWEN, E. **The fool's paradise stage in appendicitis. Lancet, Feb. 15.**

Holmes suggestively remarked that one can not tell what wood a table is made of until he lifts up the cloth. So it is with appendicitis, one can not know the exact state of the appendix until it has been exposed to view by operation. No part of the body has caused so many surgical surprises as the appendix.

The fool's paradise stage: This may come early or late in the course of the disease and its occurrence is somewhat in this manner: A patient has been complaining of pains in the abdomen for a day or two, with some tenderness in the right iliac fossa. The pulse has been at 100 to 120, temperature around 101°. After a bad night he wakes and finds that the pains have gone and he is improved in every way. The pulse has dropped, temperature is lower, and the appearance much better. Nurse and relatives recognize the great change and are delighted with it. The doctor appreciates the great alteration, but the lower part of the right rectus remains rigid, resistance in the muscles over the right iliac fossa and tenderness on pressure over the cecal region remain. The patient is not actually better; he is worse. The state of the pulse and the temperature are misleading and the sensations and aspect of the patient are not to be taken as indications of improvement in the presence of persistent rigidity of the lower part of the abdominal wall.

What exactly has happened to produce this sudden change one can not say. The swollen appendix probably has given way to internal pressure and some thick muco-pus or even a solid concretion has escaped. Or it may be that an abscess has burst its bounds. At any rate, some deeply placed tension has been relieved and quiet has been restored for a time. The continued rigidity of the abdominal muscles is evidence to the surgeon that the storm warning must not be lowered, even though some heavy clouds have been rolled away and the sky looks brighter.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

BECK, E. G. **The present status of bismuth paste treatment of suppurative sinuses and empyema. Annals of Surgery, February, 1914.**

The author and brothers have treated in all over 1,100 cases by injection of a mixture of 33 per cent of subnitrate of bismuth and 66 per cent of vaseline. The mixture must be sterile and liquefied by heating so that with moderate pressure it will fill all the branches of the sinuses.

The uses of bismuth paste are threefold, namely:

(1) For diagnostic purposes for tracing sinus tracts, etc.

(2) For therapeutic purposes in chronic suppurations.

(3) For prophylactic purposes for prevention of sinuses.

The injected paste points out clearly where the diseased structures lie. One case of tuberculous necrosis of the ribs was accurately located, the involved ribs were removed, and a cure resulted. Another case of supposed rectal fistula was found in reality to be a case of tuberculous involvement of the eleventh dorsal vertebra. A case of hip-joint disease of 16 years standing, in which 15 operations had been performed, was cured by injection of paste in 30 days.

The causes of failure to cure cases with the paste are due to many factors.

A sinus is nothing but a shriveled abscess or abscesses. The focus of the disease is often at a considerable distance from the opening or openings of the sinus, therefore it is inconsistent to try to eradicate the suppuration by only dissecting out the sinus tracts. Find the focus from which the sinus originates, eradicate it, and in practically all instances it will heal spontaneously.

It is essential that the paste should reach the focus of the disease. Through faulty technique this is not done and failure results. A common cause of failure was the failure to remove sequestra or foreign bodies such as drainage tubes.

From the author's observation, faulty technique and failure to follow the rules which have been laid down for treatment account for the majority of failures.

Injections should be repeated until the focus of the disease has been reached. The first injection should effect the desired result; if it does not the paste has not been distributed through all the sinuses, and it should be injected again. It is a safe rule to wait a week between injections. If the discharge changes its character from a purulent into a serous, and if it is sterile we should not reinject, for the sinus will heal shortly.

Only 6 per cent of the author's cases have been given up as hopeless.

For prophylactic purposes in preventing sinuses in healing tuberculous abscesses, the procedure consists in opening the abscess and injecting it at once with a 10 per cent bismuth paste, not using more than 100 grams, for absorption takes place from the new abscess wall

and poisoning may result. In 100 abscesses so treated only 1 developed a severe secondary infection, and only 4 resulted in sinuses.

It is better to inject the paste through a small incision than through a trocar. The tuberculous débris is evacuated through an incision better than it is through a needle.

The prevention of bismuth poisoning consists in not allowing large quantities of the paste to remain in the body for absorption. Should symptoms appear the bismuth must be removed by washing out the cavity with warm olive oil. The sterile oil is injected and retained for 12 to 24 hours in order to make an emulsion and should then be withdrawn by suction.

Scraping out the paste is a dangerous procedure as it opens fresh channels for absorption.

Acute suppurative processes should not be treated with bismuth paste, only chronic suppurations both tubercular and not tubercular.—(R. S.)

Seelig, M. G., and Tuholske, L. **The inguinal route operation for femoral hernia; with supplementary note on Cooper's ligament.** Annals of Surgery. Vol. LVIII, No. 6, Dec., 1913.

The authors discuss the three foremost false ideas concerning femoral hernia; namely, that the repair of a femoral hernia is an essentially simple operation; that recurrence is rare; and that as compared to inguinal hernia an anatomical exposure of the operative field is not required.

The inguinal route operation is described as follows:

First step. Incision similar to the usual one for inguinal hernia, but with the lower end continued farther on to the pubes.

Second step. Aponeurosis of external oblique opened by splitting its fibers.

Third step. Upper flap of external oblique lifted up, exposing conjoined tendon of internal oblique and transversalis. This latter is now retracted upward by slipping a retractor under its upper edge and the lower flap with a retractor is pulled downward bringing Poupart's ligament into view. The spermatic cord (or round ligament) is now retracted upward with a gauze tape. By this retraction the thin transversalis fascia immediately anterior to the peritoneum is brought into view. It is nicked and divided along the line of the original incision and each side is then caught under the retractors and drawn apart with the other structures of the flaps. This brings into view the peritoneum and usually the deep epigastric artery, which may be avoided or divided, as circumstances indicate.

Fourth step. Open peritoneum at point of convergence to form the sac and draw out any contents, replacing them in the abdomen at once, where they are retained by pads if required. If strangulation

has occurred, it may be readily freed by cutting Gimbernat's ligament, which is in full view at inner edge of femoral opening. Should the contents be adherent to the sac, the latter may, in the great majority of cases, be simply pulled from its bed by traction, as it is seldom adherent. If the sac will not free readily, the inguinal incision is prolonged onto the thigh and the sac dissected out, the hernia and sac becoming practically inguinal.

Fifth step. Introduce dressing into the sac to its lowest point, close the forceps on the sac at this point and withdraw them, everting the sac, and an inguinal hernia obtains.

Sixth step. Close femoral ring between the vein externally and Gimbernat's ligament internally by suturing Poupart's ligament (its anterior edge) to Cooper's ligament (its posterior border).

Seventh step. Suture internal oblique and transversalis to Poupart's ligament as in inguinal hernia, usually not transplanting the cord. Close the external oblique and then the skin.

The writers execute the operation practically as originally described by Moschcowitz, and they claim it stands in the same relationship to femoral hernia as does Bassini's operation to inguinal hernia.—(R. A. W.)

HYGIENE AND SANITATION.

C. N. FISKE, surgeon, and R. C. RANSDELL, passed assistant surgeon, United States Navy.

EVANS, P. N. **A contribution to the chemistry of ventilation.** Gesh.-Ingen., 36. No. 36, Sept., 1913.

Experiments of the author show that under ordinary conditions the respiratory exhalations in a room have an upward movement, and that these upward movements which remove the foul air from the breathing zone are increased by low room temperature and low atmospheric humidity. The old assumption that foul air has a greater specific gravity than fresh air is a fallacy. Thus, satuated fresh air would have to rise to 117° F. to attain the same specific gravity as expired air saturated and at body temperature. If the fresh air were absolutely dry, a temperature of 127.8° F. would be required to make it as light as the expired air; at different degrees of humidity it would have the same weight at intermediate temperatures.—(E. W. BROWN, PASSED ASSISTANT SURGEON, U. S. NAVY.)

v. KUPFFER, LUDWIG A. **The use of ozone in ventilation.** Gesh.-Ingen., II. 33, 605. 1913.

The author gives a short summary of the development of ozone technique with especial reference to ventilation and discusses in detail the present status of air purification with ozone. Ozone can

not and should not replace fresh air, but it adds two important advantages to ordinary ventilation; its effect upon odors and upon the physiological quality of the air. The air improvement results from the disappearance or diminution of unpleasant smells and a certain freshening effect upon the air. He concludes that only the higher concentrations have a toxic or unfavorable action and even these without permanent effect upon the health.—(E. W. BROWN, PASSED ASSISTANT SURGEON, U. S. NAVY.)

Ross, C., Surg., R. N. **Pulmonary tuberculosis in the Royal Navy, with special reference to its detection and prevention.** Journ. Royal Army Med. Corps, Vol. XXII, No. 1, Jan., 1914.

The incidence of phthisis is steadily declining in the navy of Great Britain, as in the civil population and other services generally. Although the greater number of preventive measures described in this paper are general in nature and must occur to most naval surgeons, a few which have been found both practicable and beneficial merit mention in review. Special watchfulness is maintained over all pulmonary cases, particularly following bronchitis and colds. All suspicious cases are sent as promptly as possible to hospital for thorough observation, in order to obtain the earliest possible diagnosis and to free the ships and barracks from sources of further infection. All chests are examined at recruit depots and on board ship as soon as practicable after commissioning, beginning with those on the sick list and those who report at sick call during the first few weeks. The weight of all officers and men under the age of 36 is taken and recorded each quarter by the physical training instructors and communicated to the medical officer, who inquires particularly into such men as show loss of weight. The result of every physical examination is entered upon the man's medical history sheet. Constant effort is made to keep all covered decks dry, and these are damped with a disinfectant before sweeping. Quarterly health lectures are required of the medical officer to every man on board on four subjects, viz: General hygiene and health principles; tuberculous disease and its prevention; venereal diseases; alcohol and its abuse. All fresh milk is to be pasteurized or boiled before consumption and "the result verified by the Ortol test." Large ships carry efficient disinfectors, and the hammocks and blankets of neighbors of infected persons are sterilized in addition to the occasional regular disinfection of the bedding of all on board. The remedies recently advocated by Fleet Surgeon Gaskell, R. N., are quoted, viz: Rounded corners and smooth surfaces in living quarters; vacuum cleaning; washable canvas deck cloths and covers for tables; enameled iron tables, etc., on the mess decks.—(C. N. F.)

BEVERIDGE, W. W. O., Lieut. Col., R. A. M. C. **An investigation into the keeping properties of condensed milks at the temperature of tropical climates.** Journ. Royal Army Med. Corps, Vol. XXII, No. 1, January, 1914.

Certain kinds of condensed milks having been found to acquire a light coffee-brown color after warm storage for longer than one month, the investigator was led to study the chemical and bacteriological process involved. Although there was no reason to suppose that the change was detrimental to the health of consumers it appeared that there might be economic loss through condensation and some nutritive loss if generally used.

The following conclusions are derived from this study:

The change in color of certain kinds of condensed milks in tropical climates is presumably due to brown color being developed by reducing sugars in solution at a certain temperature, and is likely to be more marked with an increase of acidity due to bacterial fermentation; the presence of iron in the ferric state also plays a part in the production. In sterile condensed milks, chiefly found among those brands which contain no added sugar, changes are not noticeable. Sterile uncondensed tinned milk also shows no change even after incubation at 37° C. for many months.

The increase of acidity is brought about by bacterial activity resulting from the increased temperature, and hydrolysis of the sugar follows. The bacteria concerned in the change are spore-bearing bacilli which produce an acid fermentation of the proteins. In milks containing only gram-positive staphylococci a brown color is probably never produced. It would seem that the depth of the brown color is dependent on the amount of reducing sugar produced or of iron present, and is likely to be more intense in sweetened milks, owing to the reduction of added cane sugar.

The increase in consistency, noticed in connection with the brown coloration in sweetened milks, is also due to bacillary fermentation, and some of the protein is consequently rendered insoluble.

For service use in tropical climates there is no doubt that to obtain better value, and to obviate the risk of such a change occurring, especially when milks have to be stored for considerable periods, only those brands of unsweetened milks which have been proved to be sterile should be selected.

(C. N. F.)

TROPICAL MEDICINE.

E. R. STITT, medical inspector, United States Navy.

MITCHELL, D. A., Surg., R. N. **Seven days fever of the Indian ports.** Statistical report of the health of the (British) Navy for the year 1912.

The report covers a series of 20 cases, occurring in two groups with an interval of three weeks, which may have some bearing on the length of the incubation period, the length of this being unknown. Ten cases were mild and 10 severe.

The onset was nearly always sudden. Headache was severe; frontal in nine cases; usually lasting three or four days. Pain in the eyes was a very characteristic symptom; pain always at the back of the eyes, which were suffused, but never markedly watery. This

symptom, more than any other, often led to a correct diagnosis in the early stages of the disease. Pain in the back was usually present and often severe. Pain in the limbs and joints, which has often caused comparison with dengue, was not marked. Persistent coating of the tongue was present in some cases; a furred tongue with absence of gastro-intestinal disturbances was very noticeable. Slight congestion of the fauces was present in several cases.

Two types of rash were observed: (1) An initial diffuse erythema appearing simultaneously over the whole body on the first day of the disease; (2) the true rash, appearing about the fourth to the sixth day, almost identical with that of rubella, but showing the following slight differences: (*a*) Always first and most distinct on the forearms; (*b*) difficult to detect on the face; (*c*) fades early, resembling syphilitic roseola; (*d*) desquamation never present.

Coryza was present in slight degree in two cases, clearing up in two to three days. The appetite after the first two or three days was good and there were no gastro-intestinal symptoms. Fever lasted for seven days, with the following characteristics: No rigors; initial rise to 101° or 102° followed by a fall; rise on third to fifth day, forming the saddleback curve described by Rogers; an irregular fall, reaching normal on the seventh day. Pulse slow after the first two days; tension normal.

A typical case: Admitted with moderate headache in frontal area, dizziness, pain at the back of the eyes, diffuse erythematous rash, temperature 102°, pulse 108, furred tongue, eyes suffused. Second day, pulse rose to 103°, but dropped to 101.6° the following morning and remained at this point for the day; pulse gradually fell to 84; severe pain in back and lower part of chest where a few râles were heard; tongue furred; rash almost gone. Third day, temperature 101° to 101.6°, pulse 60, back painful, eyes sore, slight frontal headache. Fourth day, no rash, pulse 60 to 72, temperature 99.2°. Fifth day, pain in back severe; tongue coated; temperature rose to 101.6°; pulse 72; a rash, resembling rubella, best seen on forearms; tongue furred; pain in back less severe. Sixth day, temperature fell to normal, rose to 99° in evening; pulse 64 to 68; rash over body: tongue furred. Seventh day, temperature normal, pulse 68, no pains, tongue clearing, rash fading, returned to duty two days later.

CLASSIFICATION OF SYMPTOMS IN 10 TYPICAL CASES.

No.	Pain in eyes.	Headache.	Pain in back.	Furred tongue.	Rash (first).	Rash (second).	Fever, duration.	Saddle back curve.
1	Present...	Present...	Severe....	Present...	Present...	Present...	7 days...	2d-5th day.
2	...do......	...do......	Present...	...do......	Absent....	...do......	10 days..	Do.
3	Absent.....	...do......	Absent....	...do......	...do......	...do......	7 days...	Do.
4	Present.....	...do......	Present...	...do......	Present.....	...do......	...do	Absent.
5	...do......	...do......	...do......	...do......	...do......	...do......	...do	1st-3d day.
6	...do......	...do......	Absent....	...do......	...do......	...do......	...do	2d-5th day.
7	...do......	...do......	Present...	...do......	...do......	...do......	...do	1st-3d day.
8	Absent....	Absent....	Absent....	Absent.....	...do......	Absent....	8 days...	1st-5th day.
9	Present...	Present.....	...do......	Present...	Absent....	...do......	...do	Absent.
10	...do......	...do......	Present...	...do......	...do......	...do......	7 days...	1st 3d day.

DIFFERENTIAL DIAGNOSIS.

In mild cases the diagnosis from rubella may be difficult or impossible.

Seven days fever.	Rubella.
Rash, best marked on forearms, a diffuse roseola.	Best marked on face and about ears, more discrete.
Glands of neck never enlarged.	Nearly always enlarged.
Fever with subnormal pulse.	Pulse commensurate with temperature.

Diagnosis from measles may be difficult until the fifth or sixth day. In mild cases it was made, as follows:

Seven days fever.	Measles.
Pink rash.	Purplish rash.
Spots small, no blotchiness.	Spots larger, blotchy.
No coryza.	Coryza present.
No Koplik spots.	Koplik spots present.
No desquamation.	Desquamation.
No complications or sequelæ.	Either may occur.

In severe cases the diagnosis was made on the following additional features:

Seven days fever.	Measles.
Eyes suffused, but not watery.	Eyes watery.
Slowness of pulse after second day.	Pulse more rapid.
Persistence of furred tongue.	Not so persistent.

The temperature curve may resemble that of typhoid, but the pulse is slow, the bowels normal, the spleen not enlarged.

Mild recurrent attacks may resemble malaria, the latter sometimes persisting without enlarged spleen and with very few parasites in the blood. Malaria is suggested in a blood film by excess of lymphocytes, severe anemia, and basophilic degeneration.

The treatment is symptomatic; sodium salicylate eases the pain in the back and phenacetine relieves the headache; purges cause discomfort and do no good, quinine increases the headache. Diet should be regulated by the appetite, which is good after the initial temperature has fallen.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

ARCHIBALD, R. G., Captain, R. A. M. C. **Intestinal schistosomiasis in the Sudan.** British Medical Journal, Feb. 7, 1914.

The author notes that cases coming into hospital with fever, headache, and frequently enlarged spleen, but without diarrhea or tenesmus may show the lateral spined ova of *Schistosomum mansoni*. He states that there may be a varying degree of leucocytosis, but that the absence of eosinophiles obscures a diagnosis of schistosomiasis. The temperature charts illustrating the article show a remittent fever course going up to 103–104° F.

The author suggests that the acute symptoms with death in some cases might be connected with some bacterial invasion of the intestinal tract as well as with the schistosome infection.

In reading this article and having in mind the marked tendency of the typhoid-like bacilli to bring about a disappearance of eosinophiles, the reviewer believes it reasonable to suppose that the schistosome etiology of these conditions was subordinate to that of some organism of the Eberth or Gaertner group.—(E. R. S.)

HEHIR, P., Colonel I. M. S. **Disease carriers in our army in India.** Indian Medical Gazette, December, 1913.

In this article the recommendation is made that no person who has had enteric or paratyphoid fever or has been engaged in nursing such cases should have anything to do with the handling of food for troops for a year afterwards.

The discussion of carriers of bacillary dysentery is very interesting. He notes that amebic dysentery is at the present day infrequent in the Army in India. It is also noted that the clinically severe cases, especially gangrenous types, are at present rare. In the author's opinion all cases of bacillary dysentery should be isolated and treated in different wards. Attention is drawn to the importance of bacillary dysentery in times of war and the necessity of being on guard against the carrier.

With reference to cholera carriers, Hehir notes that there is no way in which we can distinguish ordinary simple diarrhea from the premonitory one of cholera except by bacteriological methods.—(E. R. S.)

VEDDER, E. B. **Origin and present status of the emetine treatment of amebic dysentery.** Journ. Amer. Med. Assoc., Feb. 14, 1914.

This very important paper brings forward recent reports in favor of the value of emetine in the treatment of amebic dysentery and hepatitis.

It is noted that the experience of the author and others has been similar to that of Walker as regards the curative power of the drug in acute conditions and its failure to eradicate the encysted forms so that the tendency is for the person cured of amebic dysentery to become a carrier.

Vedder calls attention to the fact that the minimal fatal dose of emetine is several times less when administered to rabbits intravenously than when given subcutaneously, so that after seeing rabbits die with what was apparently centric paralysis immediately after intravenous doses of comparatively small amounts of emetine hydrochloride, he would hesitate before administering 1 grain intravenously in a human case. According to the author the best method of administering the drug is to give about one-third grain of emetine hydrochloride three times daily for 10 days, the drug being administered hypodermically. In such doses there is very little inconvenience experienced by the patient. Vedder has not obtained satisfactory results in giving the drug by mouth.

Quite interesting is the statement that by the use of emetine we may be able to handle cases of liver abscess with Manson's trochar and cannula procedure, thus doing away with the necessity for a more radical surgical operation.

The matter is emphasized of the impossibility of ridding a patient of amebæ with emetine, but it is suggested that the emetine may kill the amebæ which are deeply placed in the submucosa and that those more superficially located may be destroyed by such amebacidal agents as quinine and silver nitrate.—(E. R. S.)

WENYON, C. M. **The culture of Leishmania from the finger blood of a case of Indian kala azar.** Journ. Trop. Med. and Hygiene, Feb. 16, 1914.

The author notes the success obtained by Mayer and Weiner in culturing peripheral blood for Leishmania, dropping in each tube from 2 to 3 drops of blood from the pricking of the sterilized finger

of a case of kala azar. Examined on the sixth and eleventh days no growth of flagellates was observed, but one tube was found to show bacterial contamination. On the eighteenth day the five noncontaminated tubes showed an abundance of flagellates.

It is stated that the development and multiplication of Leishmania in the test tube is a practical demonstration of the possibility of the true invertebrate host becoming infected from the peripheral blood of kala-azar cases.

The author also notes that recently he was unable to obtain evidence of the presence of Leishmania by smears from an ulcer of the ear margin. He then inoculated N. N. N. medium with material obtained by puncturing the skin near the ulcer with a fine glass pipette. Three weeks later flagellates were found, thus confirming the nature of the lesion.

Wenyon discusses the subject of the nature of certain bluish protoplasmic masses, containing purple granules, which were suggested as stages in the development of Leishmania by Archibald and others. He is of the opinion that these bodies have nothing to do with protozoal infections, but may be found in normal animals.

Taking up the possibility of the suggestion that such bodies might be present in the blood of a kala-azar patient and give rise to cultural forms, he argues against this idea, that where one cultures Leishmania in abundance, as from splenic juice, there are obtained numerous flagellates within 48 hours, while in his cases it required many days for evidence of multiplication. It is his belief that the cultural Leishmania came from parasites which were present in the peripheral circulation in such small numbers as not to be capable of detection in a smear.—(E. R. S.)

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

A. B. CLIFFORD, passed assistant surgeon, and G. F. CLARK, passed assistant surgeon. United States Navy.

BROWNING, C. H., GILMOUR, W., and MACKIE, T. J. **The isolation of typhoid bacilli from feces by means of brilliant green in fluid medium.** Journ. Hyg., Vol. XIII, No. 3, Oct., 1913.

The want of a reliable not to say ideal method for isolating *B. typhosus* from feces led the authors to seek a benzol derivative which would inhibit growth of the coli group of organisms as well as the gram positive organisms commonly restrained. Brilliant green (Bayer's Brilliant Green Extra Cryst.) was found to be more actively inhibitory than malachite green. Fifty-four strains of *B. coli* were found to be invariably more susceptible to the bacteri-

cidal action of brilliant green than were any of the 21 strains of *B. typhosus* or of paratyphoid bacilli.

Method: The practical details of the method are as follows: Peptone water is prepared in the usual fashion; 20 grams of Witte's (Rostock) peptone and 5 grams of NaCl are added to 1,000 c. cm. of distilled water; the mixture is steamed in a Koch's sterilizer for ¾ of an hour and filtered through paper; 5 c. cm. are then distributed in 6 by ⅝ inch test tubes which are plugged with cotton wool and sterilized at 120° C. for 15 minutes in the autoclave (the medium reacts faintly alkaline to litmus). The stock solution of brilliant green (Bayer's Brilliant Green Extra Cryst.) consists of 1 per cent of the dye in distilled water; this is freshly made up every two or three weeks. Immediately before use a 1:10,000 dilution of the dye is prepared by adding 0.1 c. cm. of the stock solution to 9.9 c. cm. of distilled water. Of this dilution the following amounts are added to successive tubes of the peptone water, viz., 0.04, 0.08, 0.12, 0.16, 0.22, 0.3 c. cm. A loop full of feces (up to 0.4 cm. diameter where the specimen is very fluid) is then at once added to each tube and the contents are well mixed. After 20 to 24 hours incubation at 37° C. a loop full of material is taken from each tube and successive strokes are made on plates of MacConkey's medium (two 10 cm. plates in all are quite sufficient to accommodate three strokes from each dilution). The plates are then incubated as usual and are examined for typhoid bacilli.

By this means "a practically pure culture of *B. typhosus* was obtained from a mixture of two typhoid bacilli along with 2,800 other viable organisms" in feces.

The series of concentrations of brilliant green is necessary, because the optimum concentration for growth and isolation varies from case to case through varying proportions of typhoid bacilli to other organisms, the number and character of such other organisms, the character of feces and the possible varying strength of commercial dyestuffs. The stock dye should be tested with typhoid feces before being accepted for routine use.—(C. N. FISKE, SURGEON, U. S. NAVY).

MACNEAL, W. J., and SCHULE, P. A. **An efficient and convenient stain for use in the general examination of blood films.** The Post-Graduate, Nov., 1913.

Two stock solutions are prepared:

Solution A:

Eosin, water soluble, yellowish (Grubler)	1.00
Methylic alcohol, Merck's "Reagent"	500.00

The eosin dissolves readily with a little shaking.

Solution B:

Methylene blue, medicinally pure	1.00
Methylene azure (Giemsa's "Azure I")	0.20
Methylene violet, commercial (sold by E. Leitz, N. Y.)	0.60
Methylic alcohol, Merck's "Reagent"	500.00

The dyes are rubbed in a perfectly clean mortar with a few drops of alcohol to form a homogeneous paste. This is transferred to a 500 c. c. flask by rinsing out the mortar with successive portions of methyl alcohol, the flask is thoroughly shaken, stoppered loosely, immersed in warm water (50° C.) for a time, and again shaken. This solution will be improved by allowing it to stand in a warm place for a few days and shaking it at frequent intervals, as this separates the dyes from the insoluble substances present. Filtration is unnecessary. If kept in amber-colored bottles and in a dark place, these stock solutions will remain in good condition for several months. For use mix equal portions of A and B. The mixed stain will keep well for a few weeks.

ADVANTAGES.

The stain is easily prepared.

The stock solutions keep well.

It is a good differential stain for blood protozoa as well as for blood cells.

Stained smears do not fade as readily as with many of the Romanowsky stains.

The eosinophilic or basic properties can be easily varied by varying the proportions of A and B in the mixed stain.

(I have used this stain extensively during the past two months and have found it very satisfactory.).—(G. B. CROW, PASSED ASSISTANT SURGEON, U. S. NAVY.)

FLEXNER, S.; CLARK, P. F., and AMOSS, H. L. **A contribution to the epidemiology of poliomyelitis.** Journ. Exper. Med., Vol. XIX, No. 2, Feb. 1, 1914.

The authors note briefly the progress our knowledge of the pathology of epidemic poliomyelitis has made since 1909, and state that we now possess information in many ways accurate and full regarding the causative microorganism, its portal of entry into and paths of exit from the body, the period of its persistence in the tissues, the places of its location among the organs, the manner in which its presence brings about the characteristic lesions and symptoms of the infection, and certain important immunity reactions which it displays.

The data upon which this knowledge is based are being extended by experiment.

The observations in this paper aim to throw light on the epidemiology of the disease.

A strain of the poliomyelitic virus was propagated in monkeys for four years, during which time it displayed three distinct phases of virulence. The several phases cover different periods of time.

At the onset the virulence was low, but by animal passages it quickly rose to a maximum; this maximum was maintained for about three years, when, without known changes in the external conditions, a diminution set in and increased until at the expiration of a few months the degree of virulence about equaled that present at the beginning of the passages in monkeys.

The cycle of changes in virulence is correlated with the wavelike fluctuation in epidemics of the disease which also consists of a rise, temporary maximum, and fall in the number of cases prevailing. An explanation of epidemics of disease is inferred in variations or mutations among the microorganismal causes of disease affecting chiefly the quality of their virulence.—(A. B. C.)

FLEXNER, S., CLARK, P., and AMOSS, H. L. **A contribution to the pathology of epidemic poliomyelitis.** Journ. Exper. Med., Vol. XIX, No. 2, Feb. 1. 1914.

In the course of their studies on experimental poliomyelitis the authors have collected data on the pathology of the disease which they summarize as follows:

The virus of poliomyelitis is neurotropic and localizes, and probably is capable of multiplying in the extramedullary parenchymatous nervous organs. It has been demonstrated by inoculation tests in the intervertebral, Gasserian, and abdominal sympathetic ganglia.

All the ganglia show histological lesions, more or less severe, similar to those of the spinal cord and brain. The severest occur in the intervertebral ganglia, those next in severity in the Gasserian, while the mildest appear in the abdominal sympathetic ganglia. The interstitial lesions predominate over the parenchymatous, and in the preparalytic stages the intervertebral ganglia show interstitial lesions, especially pronounced at the pial covering.

Epidemic poliomyelitis is a general disease of the nervous system, although the most prominent and important symptoms are those following injury to the motor neurons of the spinal cord and brain.

The virus of poliomyelitis is highly resistant to glycerin, in which it survives for more than two years; to 0.5 per cent phenol, in which it survives for more than one year; while it succumbs after having been kept frozen constantly for several months.

It is unsafe to employ phenol to modify the virus of poliomyelitis for the purpose of active immunization.

The cerebrospinal fluid of convalescents tends to be devoid of the neutralizing immunity principles for the virus of poliomyelitis, although they may exceptionally be present within this fluid. Doubtless the immunity principles are not produced locally in the nervous tissues, but elsewhere in the body, and are carried to the nervous organs by the blood.—(A. B. C.)

AMOSS, H. L. **A note on the etiology of epidemic poliomyelitis.** Journ. Exper. Med., Vol. XIX, No. 2, Feb. 1, 1914.

Flexner and Noguchi have cultivated a minute microorganism from the central nervous organs of human beings and monkeys that have succumbed to epidemic poliomyelitis, and Noguchi has perfected a method of staining the parasite in film preparations and in sections from infected tissues.

For the cultivation of the microorganisms, fragments of the brain are placed in sterile ascitic fluid together with a piece of sterile rabbit kidney, the whole being overlaid with paraffin oil.

It has been found that the microorganism first multiplies in the fragment of brain and then gradually enters the ascitic fluid.

It is often difficult to obtain cultures in the the ascitic fluid, so the author devised a method which is more successful.

By incubating bits of brain known to contain the virus in kidney-ascitic fluid culture medium for 12 days, then crushing the bits of brain and further incubating for three days, a pure culture of the organism was obtained.

Subcultures from these tubes give good growth.

Identical bodies have been detected in blood films prepared on the twelfth day of an acute attack, from a paralyzed poliomyelitic monkey inoculated intraspinously.

The same organism has been cultivated from the blood of a monkey that had received intravenously a large dose of a Berkefeld filtrate of poliomyelitic virus.

No other microorganisms were detected either in sections of the brain or in film preparations of the blood.

The observations tend, therefore, to confirm the etiological relationship between the minute microorganism and epidemic poliomyelitis suggested by the successful cultivation and inoculation experiments reported by Flexner and Noguchi.—(A. B. C.)

ROSENOW, E. C. **Transmutations within the streptococcus-pneumococcus group.** Journ. Infect. Dis., Jan., 1914.

The author reports that he has converted hemolytic streptococcus into *Streptococcus viridans*, and the latter was then transmuted into pneumococcus. He was enabled to do the former by permitting the blood agar medium, on which the organisms were cultivated, to become dried out by standing in an incubator at 37° C. for some weeks, or by growing the organisms in symbiosis with *B. subtilis*. He transmuted the *S. viridans* into the pneumococcus by passage through animals. In order to prove the identity of a strain, he noted the hemolyzing power on blood agar, the color production, the fermenting

power on various sugars, the lesions produced in animals, the agglutinating and opsonic power, the effect of bile, sodium chloride, etc., on the organisms, the growth of the organisms in filtrates from ascites broth cultures of pneumococci and streptococci, and the production of acid in pneumonic serum. He also transmuted pneumococci into hemolytic streptococci by growing them in pure oxygen, testing out in the same manner as above noted.

This may prove of value in the future, because of the bearing it may have upon the manufacture of vaccines, antistreptococcus or antipneumococcus serum.—(G. F. C.)

ROSENOW, E. C. **The etiology of acute rheumatism, articular and muscular.** Journ. Infect. Dis., Jan., 1914.

The writer reports the results of cultures from the blood and lesions in cases of articular and muscular rheumatism, the chief characteristics of the organisms isolated, and results of experiments.

He found the best medium to be tubes containing tall columns of ascites-dextrose agar, which were inoculated at 40° C. while still liquid, one-tenth to 1 c. c. of joint fluid being used. The joint fluid should be withdrawn soon after involvement of the joint or after an exacerbation. Blood cultures were prepared by drawing 30 c. c. of blood into 15 c. c. of 2 per cent sodium citrate, adding 100 c. c. of distilled water to hemolyze the red cells, centrifuging and inoculating the sediment in the same manner as the joint fluid.

Cultures from joint fluid were obtained in 14 of 16 cases, and in 3 of 4 cases from the blood.

The cultural characteristics varied with the part involved. The organisms from joint lesions differed from those of muscular lesions, etc.

It was noted that frogs inoculated with *S. rheumaticus* and kept in the cold showed more lesions than other frogs inoculated with the same organisms and kept at incubator temperature. He feels that this explains the aggravation of symptoms on exposure to cold.—(G. F. C.)

CHEMISTRY AND PHARMACY.

E. W. BROWN, passed assistant surgeon, and O. G. RUGE, chief pharmacist, United States Navy.

STRZYZOWSKI, C. **Centrifugal method for estimating albumin in urine.** Zeit. f. physiol. Chem., 1913, 88. 25–38.

The author reports that the proteins of urine can be rapidly and accurately estimated by measuring the volume of precipitate formed

after centrifuging. The specific gravity and temperature of the liquids used, the time between precipitation and centrifuging, the number of revolutions per minute, and the duration of centrifuging must be identical for all estimations. The specific gravity of the urine is made up to 1.030 by the addition of salt, and to 5 c. c. of this urine 2 c. c. of zinc sulphate solution (Sp. gr. 1.300, prepared by dissolving 112.3 grams in 100 c. c. of water and 3 c. c. of glacial acetic acid, and making up to 200 c. c. at 15 degrees) are added and the mixture shaken; 3 c. c. of Esbach's solution (1 gm. of picric acid and 2 gms. of citric acid made up to 100 c. c.) are then allowed to flow slowly on the surface of the mixed liquids, the mixture shaken five times and after 1 minute centrifuged during 15 minutes at 2,000 revolutions per minute. Tables are given showing the volumes of precipitate and corresponding albumin content for a number of different temperatures.—(E. W. B.)

MAYER, O. **Detection of albumin in urine.** Zeitsch. angew. Chem. 1913. 26. 639–640.

Several tests should be made in order to be certain that any given sample of urine contains albumin. Ten c. c. of the urine should be boiled with 5 c. c. of sodium chloride solution (1:3) acidified with acetic acid; a precipitate indicates the presence of albumin. Another portion of the urine is mixed with an equal volume of a reagent prepared by dissolving 4 grams each of mercuric chloride and sodium chloride and 80 grams of citric acid in 250 c. c. of 6 per cent acetic acid. A white turbidity is obtained when the urine contains albumin. Mucin is also precipitated by this reagent, and a preliminary test should be made by boiling the urine with an equal volume of acetic acid, when any turbidity produced will be due to mucin. A comparison of the two turbidities will show whether albumin is present in addition to the mucin. The quantity of albumin present in urine may be estimated approximately by allowing 5 c. c. of the sample to flow onto the surface of about 10 c. c. of a solution containing 5 grams each of mercuric chloride and citric acid and 40 grams of sodium chloride in 500 grams of water. When the urine contains albumin to the extent of 0.001 per cent a white ring forms in 90 seconds at the junction of the two liquids. Should the ring appear in a shorter time, the urine is diluted with water and the test repeated until the ring develops in the time mentioned; the amount of albumin present is obtained from the degree to which the urine has been diluted.—(E. W. B.)

JOLLES, A. **New indican reaction.** Zeit. Physiol. Chem. 1913. 87, 310-312.

Urine (10 c. c.) is treated with 2 c. c. of 20 per cent lead acetate solution, filtered, and to the filtrate 0.5 c. c. of 10 per cent alcoholic thymol solution, 10 c. c. hydrocholric acid containing ferric chloride (Obermeyer's reagent). and 4 c. c. chloroform are added. On shaking, the presence of even minute traces of indican is indicated by a beautiful violet coloration of the chloroform. This reaction is much more sensitive than any indican test hitherto proposed. p—xylenol ($CH_3:CN_3:OH=1:4:5$) and o—xylenol give similar colorations, that formed by the latter being stable toward water and alkalies. The residue which remains after evaporating the chloroform solution dissolves in amyl alcohol to a red solution. and in glacial acetic acid to a violet solution.—(E. W. B.)

BASKERVILLE, C. **A report on the chemistry, technology, and pharmacology of, and the legislation pertaining to methyl alcohol.**

This paper is a reprint of a report submitted to the New York State Legislature by the factory investigating commission and is probably the most exhaustive and authoritative on the subject that has yet been published. The scarcity of informative literature on wood alcohol makes the report all the more timely and valuable. The subject is treated under the following headings: (1) Wood alcohol, what it is; (2) manufacture of wood alcohol; (3) the uses of methyl alcohol; (4) is methyl alcohol a poison?; (5) investigational evidence and recommendations; (6) legislation pertaining to methyl alcohol; (7) conclusions and recommendations. The appendices give affidavits of employees as to injury from wood alcohol used as a solvent in the industries and a summary of cases of poisoning by drinking and the inhalation of wood alcohol. The bibliography is extensive and valuable, covering as it does every phase of the subject from the discovery and manufacture of wood alcohol to recent legislative recommendations and expert evidence in connection therewith.

The names of wood spirit, wood naphtha, and pyroxylic spirit are applied to the impure methyl alcohol of commerce. This is the greenish yellow, empyreumatic, nauseous liquid formerly met with. The importance of methyl alcohol as a poison began with the introduction of the various "deodorized" grades on the market and sold in the United States under various names, e. g., "Columbian spirits," "Colonial spirits," "Manhattan spirits," "Hastings spirit," "Alcolene," "Eagle spirits," "Union spirits," "Lion d'or," etc. This deodorized product resembles ethyl alcohol very closely and costs about one-fourth as much as grain alcohol, hence its use in adulterating bev-

erages and as a substitute for ethyl alcohol in the manufacture of cordials, hair tonics, toilet waters, liniments, bay rum, and the various medicinal or flavoring agents, such as essence of Jamaica ginger and peppermint, spirits of camphor and ammonia, extract of lemon, etc.

It was generally believed that the enactment of legislation by the United States Congress June 7, 1906, permitting the use of a tax-free domestic alcohol in the arts and industries when denatured, thereby reducing its cost to about the same as that of wood alcohol, would leave no excuse for using the latter in industry, and that the stringency of widely adopted legislation pertaining to methyl alcohol in the several States would tend to reduce the number of cases of poisoning by this agent. However, a steadily increasing number of cases of poisoning by methyl alcohol has been reported in the scientific journals, and the continued adulteration of alcoholic beverages and extracts with methyl alcohol is proven by the reports of the various boards of health, pure-food commissioners, State chemists, etc.

Poisoning by wood alcohol has been practically eliminated from the service by reason of prohibiting its use as a solvent, principally for shellac. However, the detection and demonstration of wood alcohol as an adulterant, and the question of methyl alcohol as a poison, its various symptoms, its cause, its transient and permanent injuriousness, its fatal termination, the dangers of methyl alcohol in general, and, too, the method of treatment of cases of wood-alcohol poisoning, are important and of interest.

That widely varying ideas as to the poisonous nature of wood alcohol prevailed at different periods is shown by the author. Most of the early investigators believed it less poisonous than ethyl alcohol, basing their views on the general law that the toxicity of the alcohols increased with the carbon content and with the boiling point. Present authorities, however, maintain that methyl alcohol is a severe poison and explain the difference in the toxicity of methyl and ethyl alcohols by the property of the former to oxidize slowly in the animal body to formaldehyde and formic acid, while the latter oxidizes rapidly into carbon dioxide and water. The varying toxic action of methyl alcohol upon different species of animals and even upon individuals is explained by its rate of oxidation, i. e. that when rapid it is harmless. The author draws the following conclusions as to the poisonous nature of methyl alcohol from the authorities cited:

> Methyl alcohol is less poisonous to lower animals and infusoria than ethyl alcohol, but for higher animals and especially for men it is a severe toxic agent. Its poisonous properties are doubtless due, first, to a specific action, and then to its oxidation in the body, first to formaldehyde and then to formic acid. It is, furthermore, a cumulative poison. It produces toxic effects whether it be taken internally or inhaled through the lungs.

The irritating action of methyl alcohol on the skin is pointed out, and cases of impairment of vision and blindness resulting from its external application are cited. This is important in connection with the use of methyl alcohol in the manufacture of liniments, hair tonics, etc.

Methyl alcohol was chosen as the principal agent for denaturing ethyl alcohol, on account of its poisonous properties, cheapness, difficulty of removing from the resulting product, and noninterference with most of the industrial purposes for which denatured alcohol is intended. United States regulations for denatured alcohol provide that for every 100 parts by volume of ethyl alcohol of the desired proof there shall be added 10 parts by volume of the approved methyl alcohol and one-half of one part by volume of approved benzine, or two parts of methyl alcohol and one-half of one part of pyridine bases.

In connection with the subject of wood alcohol the following is taken from Merck's Annual Reports, Volumes XXV and XXVI:

The fact that some persons are able to take comparatively large doses of methyl alcohol without apparent harm does not militate against the toxicity of methyl alcohol. It is impossible to say beforehand how large a dose will display an injurious action. According to Ruhle, the lethal dose varies between 50 and 100 grams, but the toxic dose is much less, and blindness may ensue after doses of only 7 to 8 grams.

The question of treatment is therefore of importance in cases of poisoning, as soon as a reliable diagnosis has been made. When once severe toxic symptoms have supervened, however, treatment will scarcely be of any assistance. Action must therefore be taken as soon as methyl alcohol poisoning is suspected. According to Foerster, the aim of the treatment adopted must be to find ways of eliminating the poison from the system as rapidly as possible. Recourse will therefore be had to hot-air baths, copious draughts of fluids, diuretics, violent exercise, deep breathing in a well-ventilated room, saline infusion, venesection, and, finally, transfusion. Foerster considers ordinary rest in bed to be dangerous.

The favorite method of testing for methyl alcohol is based upon the oxidation of methyl alcohol to formaldehyde, which is demonstrated by means of a color reaction. According to Sailer, 0.1 gram of chromic acid and 10 drops of concentrated sulphuric acid are added to 5 c. c. of the alcohol to be tested. As soon as this mixture has assumed a green color 6 drops of it are transferred to a porcelain dish and 20 drops of concentrated sulphuric acid and a little morphine are added. Traces of methyl alcohol or formaldehyde can be recognized by the appearance of a deep yellowish-brown color, small amounts by a deep crimson-red color, and large amounts by a deep violet color. In place of morphine a few drops of freshly prepared solution of pyrogallol (0.5:10) may be used. If much methyl alcohol is present, a chocolate-brown color is produced.—(O. G. R.)

EYE, EAR, NOSE, AND THROAT.

E. J. GROW, surgeon, and G. B. TRIBLE, passed assistant surgeon, United States Navy.

SEIDEL. **The use of local anesthesia in exenteration of the orbit.** Arch. f. Ophthalm., No. 84, p. 196.

He recommends injections of novocain and adrenalin along the walls of the orbit at points corresponding to the aperture for the sensory nerves above; below, to the nasal and to the temporal sides. A double quantity of the anesthetic needs to be used on the temporal side. About half an hour after the injections anesthesia is perfect and the operation may be performed.—(E. J. G.)

GORBUNOW, G. A. **Salvarsan in ophthalmic practice.** Centralb. f. prak. Augenheilkunde, Mar., 1912.

When salvarsan was first introduced, great caution was observed in its administration in cases of optic nerve disease. With increasing experience of its use greater confidence has been obtained and now it is used freely even in cases of early tabetic atrophy. The writer has had great experience in treating syphilitic affections. He records several cases in which salvarsan was administered for lues complicated with varying degrees of optic nerve atrophy. In every case the result was markedly beneficial.—(E. J. G.)

FEHR, O. **The effect of salvarsan on the eye.** Centralb. f. prak. Augenheilkunde. June, 1912.

Has used salvarsan very extensively in various syphilitic eye conditions, and comes to the following conclusions: In 2,700 syphilitic patients treated with salvarsan he saw no damage to the optic nerves. There was no increase in the frequency of recurrences in cases so treated; on the other hand, there was a marked decrease in the frequency of iritis, neuroretinitis, and muscular affections. The conditions in which salvarsan is of most use are those cases where mercury helps most, but salvarsan is much quicker and more energetic and is especially useful in cases where the disease is of long standing and where permanent damage is to be feared.—(E. J. G.)

ZIEGLER, S. L. **Total blindness from the toxic action of wood alcohol, with recovery of vision under negative galvanism.** Ophthalmology, July, 1911.

The patient, who had been indulging in an alcoholic drink of unknown composition, became totally blind. This was an edema of the

disk which remained perfectly white during the period of blindness. The vision returned after stimulation with negative galvanism. From the continued improvement for the eight months following, it seemed to the author that secondary shrinking was likely to occur. Recovery is attributed to the increased hyperemia induced by electricity.—(E. J. G.)

LOTHROP, O. A. **Furunculosis of the external auditory canal. The use of alcohol as a valuable aid in treatment.** Boston Med. and Surg. Journ., Vol. CLXIX, No. 18.

The technic of treatment advised by the author is as follows: The canal is cleansed of cerumen, desquamated epithelium, discharge or foreign bodies, and a gauze wick inserted nearly to the drum membrane. If no discharge is present cotton is used. The wick is then saturated with alcohol, plain or boric, and the patient instructed to keep the wick wet by dropping alcohol upon it at intervals. The wick should be removed daily by the physician and another inserted. Any pocket of pus that can be located should be incised. The antiseptic action of the alcohol prevents reinfection, and the saturated wick acts as a poultice.—(G. B. T.)

ACHARD and DEBOUIS. **Local treatment of Vincent's angina with salvarsan.** Bull. Acad. de Med., No. 33.

The treatment recommended is to touch the ulcerations three times a day with a preparation of salvarsan in glycerin (gr. 0.20 of salvarsan in 6 to 8 c. c. glycerin). Improvement is rapid and ulcerations heal in about five days.—(G. B. T.)

GÜTTICH, A. **Perforated ear drum may be responsible for sudden death in water.** Medizinsche Klinik, Vol. IX, No. 46.

From irritation of the vestibular apparatus by cold water poured into an ear vertigo, nausea, nystagmus, or even general collapse have been observed. This occurs with a sound drum if the temperature of the water is low. These facts may explain cases of death, for the water entering through a perforated drum, or bursting the drum violently in diving, the reflex vestibular symptoms of nausea and collapse could cause death. Oiled cotton should be worn in the external auditory canal to protect the middle ear.—(G. B. T.)

COCKS, G. H. **The indications for operating in acute mastoiditis.** New York Med. Journ., Vol. XCVIII, No. 23.

Tenderness on pressure, elevation of temperature, the latter not so constant in adult life as in childhood, and later edema over the mastoid, are the cardinal symptoms. There are four points where tenderness may be elicited.

1. Over the mastoid antrum, i. e., just behind the superior attachment of the auricle.
2. At the mastoid tip.
3. Over the posterior part of the mastoid at the point of emergence of the emissary vein.
4. Over the posterior root of the zygoma, where the so-called zygomatic cells are located.

Cessation of discharge, with an increase in severity of symptoms, indicates a mastoid involvement, and is a cause for operation.—(G. B. T.)

GRIFFIN, E. A. **Turbinotomy.** Medical Record, vol. 84, No. 25.

The author is of the opinion that cases of nasal obstruction presenting a slightly deflected septum and a moderately enlarged inferior turbinate, are cases for turbinotomy rather than submucous resection.

The technique is as follows: Cleanse the nose with warm saline solution. Cocainize with 10 per cent cocaine solution, either with or without adrenalin. Incise the mucous membrane from the posterior tip of the inferior turbinate to its anterior tip, along its internal surface, down to the bone. Peel the mucous membrane downward from the bone. Saw through the bone from its internal surface, having the saw running parallel with the inferior border of the septum. It may be easier to saw inward and upward in some cases. Remove the fragments with the snare. Cleanse with 20 per cent argyrol solution. Pack with iodoform or plain gauze saturated in argyrol. Remove the packing the second day.—(G. B. T.)

FREUDENTHAL, W. **Why is nasal catarrh so prevalent in the United States?** New York Med. Journ., Vol. XCIX, No. 1.

Defining as nasal catarrh that condition known to be accompanied by a discharge either from the nose anteriorly, or flowing down through the retropharynx; and excluding those cases arising from deflected septa, polypi, or the like; the author is of the opinion that badly ventilated, overheated rooms, are the underlying cause of this trouble.

Pathologically there is a lack of serous secretion, the mucus becomes inspissated and then acts like a foreign body, causing a flow of serum. The epithelium becomes lost, and the mucous membrane instead of being healthy and able to absorb, becomes covered with scabs. The condition of dry rhinitis and rhinopharyngitis develop and a coryza is simulated. If the patient goes out in winter his nose will discharge because the mucous membrane is unable to absorb, and mechanical irritation, dust or what not, will produce running at the nose, since the protecting epithelium is gone.

The therapy is prophylaxis, changing the system of heating, and exposing the body to the fresh air.—(G. B. T.)

MISCELLANEOUS.

ROSATE, T., Col., Med. Corps. **The organization and work of the hospital ship "Re d'Italia."** Annali di Medicini Navale e Coloniale, Vol. II, Nos. 1, 2, 3, and 4.

PREPARATION OF THE SHIP AND ORGANIZATION OF THE SERVICE.

The steamer *Re d'Italia* of the Lloyd-Sabaudo Line passed into the hands of the Royal Navy to act as a hospital ship on the morning of September 26, 1911. The alteration of this ship for its special destiny commenced the same day in the arsenal at Spezzia, and on the morning of October 4 the ship departed for Augusta, perfectly prepared and equipped for its mission.

The seven days of preparation, however, were not spent on changes directly connected with the medical department, for the greater part of the time was taken up in the installation on board of a laundry and two steam launches. Had it not been for this work, and had necessity demanded it the ship could have taken to sea in 48 hours, in a condition to respond perfectly to its purpose as a hospital in war.

This result of such quick response was due altogether to the previous preparation. For some years all the mercantile fleet had been subjected, ship by ship, to a minute examination, so that when the occasion arose a complete idea would be had of the capacity and most convenient employment of each ship, collecting for each all the necessary data in a species of register. In addition the inspector of health, with assiduous care and active and intelligent work, had attended to the preparation of all the materials for two hospital ships, filling a void heretofore existing in our naval sanitary organization. The ships designated for use as hospital ships were trans-Atlantic liners, from among the best of those carrying emigrants to North America. Thus was obtained the certainty of a constant speed, not

less than 13 knots, stability at sea, and, above all, an internal arrangement already existing and tried, and an internal service tested by continuous presence aboard of a numerous body. But these elements, of such importance to the smooth running of a hospital ship, would have been insufficient if there had not been some alterations and new installations.

Distribution of stations: Absolutely unfitted, for example, and also insufficient for operative intervention in view of the new function of the ship, was the ambulatorium, used formerly for medical visits to emigrants, hence it was of prime necessity to transform it into a convenient and suitable operating room. This end was obtained by enlarging it in part at the expense of the common ward, and in part at the expense of the pharmacy, using for the pharmacy part of the hospital department for women. The men's department next to the operating room was transformed into a small ward for serious cases and for officers, substituting for bunks iron beds fixed to the deck and separated by a space which permitted passage between them.

The steward's domitory was transformed into an ambulatorium, and a chemical laboratory fitted up in a small officers' dining room. Upon a basis of 500 beds this many sick and wounded being calculated upon, the superfluous beds were cleared away, and in places where there was not much room medical supplies were stored. The main storeroom was located centrally and contained all the larger articles, such as mattresses, linen, furniture, etc. Near the poop, in the first corridor, was situated the X-ray room.

New appliances: A steam laundry, a drying room, and two steam launches were supplied.

Division of departments, assignment of beds, outfitting: Four wards were established with a capacity each of about 100 beds, and it was decided that under ordinary conditions there should be three surgical and one mixed ward, containing the usual medical cases. Later, in Libia, the number of beds was raised to about 700, including those for officers, and this arrangement was followed. Two wards of about 150 beds each were reserved for surgical cases, and the other two of about 200 beds each were used for ordinary diseases and convalescents. It is to be noted that each ward was equipped to take care of minor surgical cases, reserving the operating room for cases of a certain gravity and importance.

Each dressing room was provided with a surgical table, an electric sterilizer, a metal locker for sterile supplies, water, and electric lights, capable of projection. Each ward had also its linen supply and spaces not suitable for other purposes contained the pans and utensils.

Hospital equipment: Everything was provided with the greatest care and attention to detail. At no time was there ever experienced

a lack of anything necessary in medical or surgical treatment, and in addition there were appliances for diagnostic research, and for chemical and bacteriological examination of water and bacteriological examination of suspected material.

Methods of transportation of the sick and wounded: As means of transportation of the sick and wounded the ship was abundantly provided with stretchers of the Royal Navy model and with immobilizing frames, while for embarking and disembarking of the sick and wounded there was a large supply of English hammocks.

English hammocks and the system of unloading: We term English hammock a parallelepipedon of cloth, open on one side, inside of which the wounded is contained. In other times when the ship did not possess the present means, especially the sick quarters, English hammocks were used as beds for the sick, chiefly because they could be suspended like other sailors' hammocks. Fortunately, in equipping the ship at Spezzia, there were furnished a number of English hammocks, fitted with iron crosspieces and made so that they could be used in raising and lowering by being attached to the boat davits.

Dispensary, ambulatorium: A place was provided for the morning visit of the crew, civil and military, and for the ambulatory treatment of slight affections.

Morgue: Owing to the function of this ship, it was not possible to neglect the provision of a mortuary chamber. This was well separated from the wards and near the latrine on the poop, and was provided with double doors of iron and wood.

Isolation wards: There originally existed an isolation ward on the ship, which was divided into two parts, one being used for women and one for men. This was used to separate different infections and at times to isolate in one the insane cases.

DESCRIPTION OF CERTAIN SPECIAL DEPARTMENTS.

Operating room: The space occupied by the operating room was 4.80 meters by 3.75 meters (16 feet by 12 feet 6 inches) opening on the officers' ward and having light from above and the sides. The examining table, used in emigrant service, was discarded, and a Bonini table, furnished the ship by the first department, was installed. This was fixed to the deck, but it was possible to change the position of the patient. Above the table were two clusters of lights of six each, adjustable to any position necessary. Arranged around the sides of the room were wash basins, autoclave, and tables for surgical instruments and dressings.

Pharmacy, dispensary: The pharmacy was situated in the space formerly occupied by the female ward, and to the right of it was situated the ambulatorium, and to the left, the operating room. An abundant stock of all useful drugs was kept ready for use.

X-ray room: Near the dressing room of the second ward was situated the X-ray room. It was painted black and capable of being hermetically closed, so that even the least penetration of light was avoided. A Magine machine with interrupter was provided. All the accessories for regulating the current and for fluoroscopic work were furnished. Many tubes were in use, but the one most frequently in den and was Muller's, with a water cooler.

Microscopical laboratory: A well-fitted laboratory was installed. located about amidships. An Alba autoclave, with a Bartheld benzine lamp, a lamp with a Bunsen burner using denatured alcohol. and a hand centrifuge were provided. Complete equipment for all the routine microscopical, chemical, and bacteriological examinations was provided.

Wards: In each ward was a dressing or treatment station, in which were provided such surgical instruments and dressings as were needed, and the usual antiseptic solutions. The fourth ward, purely medical, did not possess such an equipment, merely having a treatment station.

Personnel: In charge of each ward was a senior medical officer. rank of major (Medical Corps), assisted by a junior, rank of captain or lieutenant, with a Hospital Corps force consisting of a steward (or rather corresponding grade) and hospital apprentices.

A pharmacist of the second class was in charge of the dispensary. assisted by a steward, who had charge of the supplies and the paper work. So far as possible with the sparse number of hospital corpsmen, it was endeavored to retain the same one in charge of the dispensary, storeroom, and isolation wards and morgue, as well as in charge of the laundry.

Medical service: The medical service was run as near like similar duty in shore hospitals as ship life would permit. The same hour for sick call, giving out medicines and food, and the same system of paper work and sanitary statistics were followed.

The junior medical officers took the days' duty in turn, and a junior medical officer had supervision of transporting sick or wounded.

Hospital administration: The same conditions were embraced in the contract with the company as existed in transport ships regarding subsistence, and it gave considerable difficulty to the sanitary direction to establish at first a suitable and convenient series of rations.

In the contract the rate of subsistence was fixed at L.145 (approximately \$0.29) for the soldiers in transport, and a greater expenditure than L.060 (\$0.12) was forbidden in the cost of medication. But the presence of sick aboard a transport is the exception, while, of course, in a hospital ship it is the rule. To avoid a contest between the

society and the Government, it was necessary to keep the expense down to the amount fixed in the contract. Finally an agreement was reached with the direction of the company prescribing these diets; an absolute liquid for those unable to take anything except broths, milk, etc., and a mixed diet, composed of various food, but allowing selection to be given to those who were not able to take the ordinary or house diet.

Thus existed three diets—house diet, special mixed, and liquid. The special mixed was changed daily so uniformity of diet was obtained throughout the wards and a variety supplied.

The diet of the under officers was fixed at the special mixed with eggs and coffee. To determine the daily food expenditure this system was evolved. A daily statement was made of the number of sick, the place of embarking, the ward to which assigned, and the number of ordinary and special rations. This was furnished to the civil commissary, representing the society. The only extra expense incurred was due to the amount of ice used. This was signed by the officer of the ward, and the director or executive of the hospital, and was a claim by the company against the Government.

Receipt of articles of value: Duplicate receipts were made in the ward for valuable articles, and thus complete record was kept and all trouble avoided. If the patient upon disembarking was in grave condition, his things were turned over to the local authorities.

Personal effects: Lockers were provided, but it was found when many patients were on board this system was not of such service as when the number was limited. When things were crowded, personal effects were made up in parcels and kept at the foot of each bed.

Records of the transfer of sick and wounded: The duty of the ship to take sick and wounded from numerous places and to disembark them in Italy in different ports made it essential that there should be accurate record so as to avoid confusion. In addition to a precise statement of the number received and disembarked, a catalogue had to be kept of the individuals, with an account of the nature and extent of their disease or injury. At the end of each voyage, as well as the end of each month, a report was made to the minister of the navy and minister of war and to the Intendenzia General of the movement of the sick and wounded.

With these ordinances the hospital ship *Re d'Italia* has performed duty uninterruptedly during the whole period of the war, nearly 13 months, and also later, until November, 1913, and has accomplished the following work:

Miles traveled	36,982
Sick and wounded treated	11,112
Hospital sick days	41,580

Principal data of the ship:

Length, 131 meters, or ________ feet__	430
Breadth, 16.50 meters, or ________ do___	54
Tonnage:	
Gross ________	6,237
Net ________	3,982
Bunker capacity:	
Coal supply ________ tons__	1,000
Reserve ________ do___	750
Mean daily coal consumption ________ do___	87
Speed:	
Maximum ________ knots__	14.5
Normal ________ do___	13.0
Wireless transmission, approximately ________ miles__	150-200
Cold-storage receiving capacity, approximately ________ tons__	150
Maximum hospital-bed capacity in use ________	880
Crew:	
Officers, civilian ________	13
Crew, do. ________	116
Military personnel:	
Officers ________	12
Enlisted ________	70

TRANSLATOR'S NOTE.—For the sake of brevity it was necessary to omit certain detailed and minute descriptions.—(G. B. TRIBLE, PASSED ASSISTANT SURGEON, U. S. NAVY.)

REPORTS AND LETTERS.

CORRESPONDENCE CONCERNING THE ARTICLE "SOME ASPECTS OF THE PROPHYLAXIS OF TYPHOID FEVER BY INJECTION OF KILLED CULTURES," BY SURG. C. S. BUTLER, UNITED STATES NAVY, WHICH APPEARED IN THE BULLETIN, OCTOBER, 1913.

WAR DEPARTMENT,
OFFICE OF THE SURGEON GENERAL,
Washington, D. C., November 24, 1913.

The SURGEON GENERAL, UNITED STATES NAVY,
Washington, D. C.

SIR: An article by C. S. Butler, surgeon, United States Navy, on the subject of "Some Aspects of the Prophylaxis of Typhoid Fever, etc." appeared in the October issue of the Naval Medical Bulletin.

I desire to call your attention to several inaccuracies in this article, and to one in particular. The one which I consider that it is especially necessary to correct is on page 493:

> In the Texas encampment only 9,000 of the 13,000 men had received the prophylactic up to July 1, which was 10 days before the camp was broken, so that at least 4,000 of them were, so far as vaccine was concerned, nonimmunized and therefore liable to infection with typhoid fever. Of the two cases of typhoid which occurred at San Antonio one was in an immune and one was in a nonimmune.

This statement is entirely incorrect, and, if allowed to go uncorrected, it would lead to the assumption that vaccine was not necessary in that camp to prevent the occurrence of typhoid fever. Surgeon Butler's mistake, apparently, arises from the misinterpretation of a paragraph which occurred in the report of this office for the year 1911, page 51, as follows:

> The orders for mobilization of a division in Texas were published on March 6, 1911, and the first regiment arrived on March 10, 1911. It was decided to immunize the entire command against typhoid, and an order to this effect was issued by direction of the Secretary of War on March 9, 1911. Inoculations were begun as soon as possible and continued as additional troops arrived. Up to June 30, 1911, there had been 8,097 persons treated at San Antonio. Many men had already received the prophylactic at home stations, and some organizations arrived on the ground with as many as 80 per cent of their personnel immunized. The mean strength of the command at San Antonio was approximately 12,000.

It appears that Surg. Butler has interpreted this paragraph to mean that of the entire command only 8,097 men were immunized against typhoid by the prophylactic. As a matter of fact, all other men in the camp had been immunized voluntarily at their home stations before they left for the camp. It was not considered necessary to immunize those who had recently been immunized voluntarily. Every man at this camp who was not immunized before arrival was immunized as soon as practicable after arrival.

The second inaccuracy that I desire to call attention to is that appearing in the last paragraph, page 493:

> From this table it appears that the incidence of typhoid fever has fallen from 6.74 per thousand mean strength in 1901 to 2.43 per thousand in 1910.

Surg. Butler infers that the reduction to 2.43 in 1910 was entirely due to sanitary measures. However, the typhoid prophylaxis was begun voluntarily in 1909, and quite a number were immunized in 1910. Thus the rate for 1910 shows a material reduction, which, in the opinion of this office, was due not only to sanitary measures but to the large number of voluntary immunizations.

On page 494, paragraph 3, Surg. Butler attempts to draw some comparison between the cases and the death rates for typhoid fever among the immunized in the Army and among the nonimmunized civilian population in European cities. It will be readily apparent to you, upon casual observation, that the 14 cases and 1 death can not be used as an annual rate for the 70,000 individuals. There were some voluntary immunizations in 1909, some in 1910, and some in 1911, in the latter year the immunizations being made compulsory. Maj. Russell estimated in the spring of 1912 that 70,000 were immunized in the Army. The 14 cases and 1 death had occurred during the years 1909, 1910, 1911, and the early part of 1912 in those immunized, and not in the 70,000 during one year.

In order to obtain an annual rate it will be necessary to make a grand total from the number immunized in all the years in question, as against the number of cases and deaths occurring during these years.

I trust that Surg. Butler's attention may be called to these inaccuracies and that there may be some way possible for him to impart this information to the readers of the Bulletin.

Very respectfully,

GEO. H. TORNEY,
Surgeon General, United States Army.

This letter was referred to Dr. Butler, who replied as follows:

Referring to the first of the inaccuracies attributed to my paper by Surg. Gen. Torney I have to state that this assertion was taken

from the article cited in my paper (reference 3) and not from the report of the Surgeon General's Office, 1911, as he infers. The article in question is that by Lieut. Col. J. R. Kean, Medical Corps, United States Army, and the quotation is from the first of the two paragraphs on typhoid prophylaxis, Volume LVII, No. 9, Journal of the American Medical Association, August 26, 1911, page 714, which I herewith reproduce in its entirety:

Perhaps one-fourth of the troops arrived at San Antonio already immunized by voluntary antityphoid inoculations given them at their posts. It was concurrently determined by the division commander and the War Department that the time had arrived to make this procedure compulsory for troops taking the field and it was so ordered and carried out as rapidly as the prophylactic culture could be supplied from the laboratory of the Army Medical School. The technic was simple. The site of puncture, usually the outer side of the left arm, was sponged off with alcohol and a small area sterilized with tincture of iodine, the injection made with a sterile syringe, and the puncture sealed with collodion The first dose is 0.5 c. c., the second and third being 1 c. c. each. An interval of 10 days is allowed between doses, the entire procedure thus taking 20 days. The injection is made into the subcutaneous connective tissue and not into the muscles. There was practically no puncture infection and the reaction was mild or absent in 90 per cent of the cases treated. In no case was it followed by serious results. There were up to July 1, 8,097 men immunized.

Instead of using 8,097 and 12,801 in my paper I used the round numbers 9,000 and 13,000, as exact figures were not deemed necessary.

In view of the fact that the figure quoted by Gen. Torney, 8,097, is the same as that used by Col. Kean, it is probable that what was meant was that 8,097 of the men were immunized at San Antonio and the balance of the 12,801 had already been immunized when they arrived there, so that all were immunes.

The paragraph, however, begins with the observation that perhaps one-fourth of the men had been immunized when they arrived at San Antonio and closed with the definite statement that of the 12,801 persons of whom he had been speaking, "there were up to July 1 8,097 men immunized." It will thus be seen that I did not misquote Col. Kean. I was gratified to learn from Surg. Gen. Torney that Col. Kean did not mean what was stated above, but on the other hand that all the men had been immunized.

In answer to the second allegation of inaccuracy, that referring to the decrease of typhoid in the United States Army, it will be seen from the table published by Maj. F. F. Russell in the Journal of the American Medical Association, Volume LIX, No. 15, page 1364, October 12, 1912, that my statement is correct. For convenience of reference, this table, which was shown in my paper, is reproduced here.

Decrease in typhoid following antityphoid vaccination.

Year.	No.	Cases (ratio per 1,000 mean strength).	No.	Deaths (ratio per 1,000 mean strength).	Vaccinated persons.	
					Cases.	Deaths.
1901	552	6.74	72	0.88	....	....
1902	565	6.99	69	.85	....	....
1903	348	5.14	30	.44	....	....
1904	280	4.77	20	.33	....	....
1905	193	3.39	17	.29	....	....
1906	347	6.15	15	.26	....	....
1907	208	3.87	16	.29	....	....
1908	239	3.20	24	.31	0	....
1909	282	3.35	22	.26	0	....
1910	198	2.43	14	.17	0	....
1911	68	.82	8	.097	12	1
1912 [1]	7	.20	1	.003	3	[illegible]

[1] Ratio for 1912 based on experiments for first half year.

A glance at the third column will show that from 1901 to and including 1908 there was a decrease in the incidence of typhoid from 6.74 per 1,000 mean strength to 3.20, a decrease of 2.1+ times. During 1909, in spite of the vaccination of an unknown number of men, the rate increased from 3.20 to 3.35 per 1,000 mean strength. In other words, it showed its tendency to vary back and forth just as in previous years, but taken as a whole from 1901 to 1909 there was a decrease, and a very great decrease, in incidence. From 1909 to 1912 there has also been a great decrease in incidence; there is no gainsaying that, but the point I made in my paper was that this might reasonably be attributed partly to the prophylactic and partly to the general "tightening up" in sanitary precautions all along the line rather than that the vaccination should, as it seems to me, unreasonably take the whole credit. But if the table quoted is correct as published, it would seem that my statement "that there has been some influence other than vaccination which has operated to lower the yearly incidence of typhoid fever in the United States Army almost steadily since the Spanish-American War," will have to stand.

Regarding the third inaccuracy, namely, that concerning the incidence of typhoid amongst our body of immunes and the yearly incidence of typhoid among nonimmunes of certain foreign cities, it is evident that I meant simply to convey the idea that though vaccination, combined with good sanitation, had accomplished good results in our Army, strenuously applied sanitary measures had an excellent reason to be, as was demonstrated by the cases of foreign cities cited. Maj. Russell's figures of 70,000 immunes with 14 cases and 1 death were published, but I had no means of getting at the yearly rate, and so I said that "up to the spring of 1912, among 70,000 individuals who were vaccinated there had been 14 cases of typhoid and 1 death." My attempt was to give a general idea rather than a mathematically accurate statement.

A more accurate idea of this can be gotten, however, by referring to the column of deaths per 1,000 in the table above given. It will be seen that in 1911 the ratio of deaths per 1,000 mean strength was 0.097, or 9.7 per 100,000, and for 1912 a computed ratio of 0.003, or 0.3 per 100,000. By referring to the following table taken from Rosenau, Preventive Medicine and Hygiene, 1913, page 76, it will be seen that the two death rates quoted for these immunes have been equaled or bettered by one or more foreign cities using preventive measures other than bacterial immunization.

A comparison between the prevalence of typhoid fever in this country and abroad is impressive. The following 10 European cities, with a total population of about 15,000,000, have an average typhoid rate of 2.4 (this should be 3.4 C. S. B.) per 100,000 during the 10 years 1901–1910:

Annual death rates from typhoid fever per 100,000 population in 10 European cities.

	Average for 10 years 1901–1910.	Average for 5 years 1901–1905.	1906	1907	1908	1909	1910
Stockholm	1.7	3	2	2	1	5.0	1.8
Christiana	2.4	3	4	2	2	1.7	1.6
Munich	2.5	4	2	3	3	1.9	1.4
Edinburgh	2.9	8	3	3	2	1.2	.3
Vienna	3.7	4	5	3	4	2.8	3.8
Hamburg	3.7	4	4	3	4	3.3	4.1
Berlin	3.8	4	4	4	4	4.2	2.9
Dresden	4.2	4	7	2	6	4.2	2.2
Copenhagen	4.5	8	4	2	7	2.7	3.6
London	4.7	8	6	4	5	2.2	3.3

The rate for 1910 for the 10 cities combined (15,000,000 people) is 2.5 per 100,000.

The first part of my paper was a mild protest against attempting to compare conditions so eminently dissimilar as the Florida encampment in 1898 and the Texas one in 1911—I should be greatly disappointed if I had fallen into a similar error myself.

In the interest of bacterial immunization and to foster its steady growth, and to prevent a reversal of popular feeling toward it, I think that we professional men can not be too careful in defining its exact measure of credit, nor too strenuous in our efforts to prevent overstatement as to its advantages.

C. S. Butler.

In the final indorsement by the Acting Surgeon General of the Army the following statement was made:

In this connection it may be of interest to you to know that during the year 1913 only three cases of typhoid fever, without a death, occurred in the entire Army, American and native troops, stationed at home and abroad. Two of these cases occurred in the United States, both being in recruits of six and

four days' service, respectively. Neither, of course, had been immunized when infection was acquired. The case with the six days' service had not received the first dose of the prophylactic prior to his admission to hospital. The third case referred to occurred among the troops serving in China. This man had been immunized in 1911.

MALARIA ON U. S. S. "TACOMA" FROM FEBRUARY, 1913, TO FEBRUARY, 1914.

By I. S. K. Reeves, passed assistant surgeon, United States Navy.

After the severe outbreak of malaria on the *Tacoma* which was reported by Dr. Kaufman in the Bulletin of April, 1913, all men who had been admitted to the sick list with malaria were transferred to other ships. Five officers who had been admitted were retained on board.

On February 13 the ship sailed for Peurto Cortes, Honduras, where she remained about four months. About a month was spent at target practice, etc., and two months in the United States. During this time there was practically no malaria aboard.

The ship (with crew of 300) then spent a month (September 13 to October 13) anchored in the Coatzacoalcos River, at the town of Puerto Mexico. Here the crew slept under mosquito bars and was not allowed ashore. Only three cases of malaria appeared in that port, but soon after departure nine cases developed which were undoubtedly infected there.

On or about December 1 the *Tacoma* anchored in the Panuco River, practically in the same position she was in the previous year when the outbreak of malaria occurred.

The town of Tampico at which she anchored was, at that time, preparing for an attack from the rebels and large numbers of immigrants and soldiers were pouring in from the interior. Many of these were subjects of malarial infection. The ship was thoroughly screened and other prophylactic measures as recommended were carried out except that the chief petty officers were allowed ashore until sunset.

Quinine prophylaxis as recommended by Castellani and Chalmers was carried out. There were some mosquitoes on board in spite of the screening, but evidently few compared with the number of the previous year.

The ship remained in the river opposite the town for 44 days, during 4 days of which time there were large numbers of refugees on board, many of whom were infected with malaria and were not supplied with mosquito bars.

Twenty-four cases of malaria appeared which were evidently infected at Tampico. Two-thirds of these were tertian, and one-third estivo-autumnal.

Rarely was a patient more than 3 days on the sick list, but there were 10 readmissions.

In ordinary cases quinine (gm. 1.25 t. i. d.) was given by mouth, but in those cases which were accompanied by gastrointestinal irrition or marked by more severe symptoms, intramuscular injections of quinine (chlorhydrosulphate gm. 1.50 daily, or oftener) were given in gluteal or pectoral muscles with excellent results, and no ill effects beyond small areas of induration and tenderness at the seat of four injections.

The pectoral muscle seems the most desirable place for injections because of the small amount of inconvenience caused the patient. In treating patients who could not retain quinine in the stomach in any form or who did not respond to it when given by the mouth, excellent results were obtained with this form of treatment.

The results of carelessness in the intramuscular injections of quinine are so distressing that the importance of perfect technique is emphasized. This method of treatment causes sufficient pain and inconvenience to the patient to make it indicated only when gastrointestinal irritation exists or when the patient does not respond to quinine given by the mouth.

None of the cases attended by me were of sufficient gravity to warrant the trial of salvarsan. When the *Tacoma* arrived in Portsmouth, N. H., all the cases were well under control and doing duty.

Of the five officers who had malaria during the outbreak of the previous year only one was readmitted. Two officers were admitted who were not on the ship during her other visit to Tampico, and one officer who had escaped infection at that time.

In view of the facts that malaria existed in a large proportion of the inhabitants of Tampico, that anopheles mosquitoes were numerous during our stay in that port, and that we escaped a severe outbreak, I believe that ships going to such places will not be seriously affected, provided the prophylactic measures recommended by the Bureau of Medicine and Surgery are carried out.

EXTRACTS FROM ANNUAL SANITARY REPORTS FOR 1913.

U. S. NAVAL HOSPITAL, CHELSEA, MASS.

By G. B. Wilson, medical director, United States Navy.

During 1913 there were 109 cases of syphilis admitted or readmitted to this hospital, and in every case where the diagnosis was confirmed by the dark field illuminator or Wassermann reaction salvarsan or neosalvarsan was given.

The intravenous method has been used in every case (283), and no veins have been entered by the open method. Double-distilled water

has been obtained from the navy yard, and no deleterious effects have been noted. At times the supply of distilled water has been inadequate and the preliminary demonstrating of the needle in vein by salt solution has been omitted. Unquestionably some extravasation of neosalvarsan has taken place, but there have never been any subjective or objective signs of such on the following day. In many cases the same vein has been used for repeated injections.

The number and frequency of the injections with neosalvarsan depends entirely upon the virulence of the infection and the results of blood examination. The number of neosalvarsan injections for each patient varied from 1 to 10. The usual interval is one week. and the dosage varies. The present technic is to give 0.6 gm. neosalvarsan intravenously, while the second and all later doses are the full therapeutic doses recommended. In a few resistant cases the latter dose has been slightly exceeded. Mercurial treatment is given in conjunction with neosalvarsan, the succinimide intramuscularly from 3/5 to 1 grain biweekly. Wassermanns are made every two weeks, and no patient leaves the hospital, except in a few instances where men are doing duty at the local navy yard and can return for prescribed treatment, until at least one negative Wassermann is obtained. In every case, on discharge, a recommendation that further antiluetic treatment be continued and a periodic Wassermann made is entered upon the health record.

Three cases were returned for further salvarsan treatment, Wassermann having become positive, and it is possible that more were admitted at other hospitals. It is not known whether the above patients received consistent antiluetic treatment, but it is a fact that adequate treatment was not given.

Many patients consider the obtaining of a negative Wassermann sufficient and hence do not cooperate with subsequent treatment.

In one case of tabo-paresis the Smith-Ellis technic was employed. but the patient was transferred to the Government Hospital for the Insane before a thorough trial of the treatment could be carried out. This patient had been treated outside the service for some time in an attempt to conceal the disease.

Three cases of malaria were treated with 0.9 gm. neosalvarsan intravenously; in all the plasmodia had been demonstrated; one had no quinine, the other two had quinine previous to the neosalvarsan. In each case the plasmodia disappeared, but the patients have passed on with the request that this hospital be notified if the organisms are again demonstrated, attached to the health record.

Two cases of Vincent's angina, one in a syphilitic who had several doses of neosalvarsan, were greatly improved by the local application of the same drug.

Gonococcus vaccine has been used in the treatment of arthritis following gonorrhea, and seems, under proper dosage and interval, to be a material aid to other forms of treatment.

U. S. S. COLORADO.

By A. J. GEIGER, surgeon, United States Navy.

A mild epidemic of scarlet fever broke out aboard the ship while at Guaymas, Mexico. In all 12 cases developed. Generally the disease was mild, and no cases developed complications. The cases were quarantined ashore at the Southern Pacific Railroad Hospital at Empalme, where they received excellent care.

The source of the infection could not be positively ascertained. When the epidemic appeared aboard, the ship had been at Guaymas beyond the ordinary incubation period. A careful inquiry concerning cases of scarlet fever at Guaymas or vicinity failed to show any cases present ashore. Curiously enough, the epidemic started about four days after the crew had shifted from whites into blues, the men having previously been in whites from the time the ship had reached Mexico. Several men had been received from the training station at San Francisco prior to the ship's sailing for Mexico, and at that station scarlet fever was present. Although the men had been aboard for more than two months before the first case appeared, it is suspected that some infected clothing had been packed in the men's bags, and when these bags were unpacked for the purpose of changing into blues the contagion was spread about the ship. This explanation seems more likely to be the true one, as none of the early cases showed association in any way, appearing in different portions of the ship in men who had not been in any way associated.

The following method was used to control the epidemic and was fairly successful:

The forward portion of the forecastle was completely screened in with canvas, and all cases of tonsillitis were here isolated and kept under observation. In the meantime a gargle, mouth wash, and nasal spray were used every hour, not only for treatment, but to prevent, as much as possible, the spread of the contagion, if present. As soon as the eruption was noted the patient was placed in the isolation ward and transferred ashore as soon as arrangements could be completed.

While these scarlet fever patients were isolated on shore, most of them convalescent but still able to spread contagion, orders were received for the *Colorado* to return to San Diego for target practice. The question then arose as to where these patients could be isolated on the ship, the isolation ward being entirely inadequate. After con-

sidering various places, the after port gun room on the first deck was selected. A toilet seat was readily connected with the scupper in one corner of the room and screened with canvas. A fire hose with a valve on the nozzle was led into the room for the purpose of flushing and keeping the decks clean. The room is fitted with a watertight door and was kept ventilated by means of a blower. It proved to be both comfortable and convenient. On reaching San Diego the patients were transferred to a camp ashore and the room fumigated with formalin and permanganate. After target practice, when the ship was ready to sail for San Francisco, the men were again isolated in the same room, and upon arriving at San Francisco they were transferred to the U. S. Naval Hospital, Mare Island, Cal.

U. S. S. VIRGINIA.

By G. L. Angeny, surgeon, United States Navy.

During the month of December, while this ship was at Tampico. she, with the other naval vessels at the time stationed there, acted as a refuge for such persons as were seeking an asylum of safety during the attack of the revolutionists on the town. The *Virginia* cared for 176 refugees, 37 men, 66 women, and 73 children. They were placed in flag quarters and two after gun deck compartments. Many of these refugees required medical treatment, mostly for minor ailments, but a large percentage of them showed malaria infection. Among the refugees on the *Virginia* was a trained nurse who assisted in the care of the sick, and whose services were of inestimable value.

Fighting at Tampico: The attack of the revolutionists on Tampico lasted four or five days, with desultory fighting most of the time. There was no important battle. The writer had no opportunity of seeing any of the men injured in the fighting until nine days after the last engagement, when he visited the Hospital Civil at Tampico. Eighty men and three officers were being cared for at that institution at the time of this visit. A member of the staff stated that there had been six deaths, all of them penetrating wounds of the abdomen.

This hospital can accommodate about 200 patients, but has no operating room, and nothing was attempted with the injured beyond plain dressings. There were two cases of penetrating wound of the skull, each showing paralysis of one arm; both appeared to be doing well. There were two cases of penetrating wound of the chest and lungs; one of these was doing well, the other showed evidences of septic pneumonia, and had little chance of recovery. The hospital appeared to be well supplied with surgical dressings. Most of the injuries were of the extremities (hands and feet), and were strongly

suggestive of having been self-inflicted. It is stated that this is a not uncommon practice among Federal soldiers, to avoid compulsory military service.

Only the injured of the Federal forces were cared for at the Hospital Civil. The revolutionists carried all their injured with them. Neither side gave much attention to the disposal of the dead. At several points three or four bodies were piled in a heap, covered with brush, and an attempt made to burn them. The burning that resulted from such efforts was only a little charring of the clothing and surface of the bodies. No further attempt was made to dispose of these stinking heaps until they were finally buried by the native residents as they cautiously returned to their homes about a week after the last day's fighting.

U. S. S. MINNESOTA.

By F. A. Asserson, surgeon, United States Navy.

On account of the high death rate, 50 per 1,000, Vera Cruz can not be considered especially healthy, though the sanitary conditions of the business and central portions of the town are excellent. The streets in this section are well paved with asphalt and very clean. The remainder of the streets, to a considerable extent, are paved with cobble stones and not as well kept. Those on the outskirts of the town are not paved or well kept.

The most healthful time of the year is during the dry season, from November until April, while the rainy season during the months of June, July, August, and September is the most unhealthful time of the year.

There are no diseases endemic in Vera Cruz, unless we consider malaria and tuberculosis as endemic. The most prevalent diseases are tuberculosis, malaria, and gastro-intestinal disorders, especially in infants. At present there is an epidemic of smallpox, the first case having been imported from the North. There have been about 45 cases, with 5 deaths. There are still remaining 11 cases (isolated), 7 of which are convalescing.

The death rate for all diseases and accidents is 50 per 1,000, or 2,000 deaths a year out of an estimated population of 40,000. About 25 per cent of deaths are due to tuberculosis, 20 per cent to gastro-intestinal disorders, and 10 per cent to malaria.

A crusade against yellow fever, which of course included extermination of mosquitoes, was started in 1903, and the last case of yellow fever in Vera Cruz occurred in September, 1909. Both malarial and yellow-fever mosquitoes are prevalent in the outskirts of town and to some extent in town. During the rainy season they become worse everywhere.

The sanitary regulations are very good and are well carried out in regard to inspection for yellow-fever suspects in all parts of town. The central portion of town is kept very clean and the sewers are flushed weekly by the fire department, then crude oil poured into them. The outer portion of town is not so well cared for. The sanitary commission is composed of one engineer and four doctors. The town is divided into four sanitary districts, each district being controlled by one of the doctors of the commission, who is responsible for the condition of his district. Each doctor has his corps of inspectors and sanitary laborers.

The quarantine regulations are similar to those of the United States, and are strictly enforced. The hospitals for isolating cases from ships are on Sacrificio Island, but have not been used in a number of years.

The water supply is from the Jampa River, 9 miles from Vera Cruz, and is pumped from there to a reservoir on a hill outside of town. It is excellent water, and there are no water-borne diseases in Vera Cruz.

The drainage and sewerage system, which was completed six or seven years ago, is excellent and adequate most of the time, but during some of the heavy rains the sewers can not handle the excess of water which floods the streets. On account of the lack of fall of pipes, as Vera Cruz is but 6 or 7 feet above sea level, all sewage has to be pumped into the sea.

There are four hospitals in town. The civil hospital (San Sebastian) has a capacity of about 300. It is poorly equipped, dirty, and full of flies. This hospital, which is supported by voluntary subscriptions, was at one time wealthy, but is now very poor. Patients can be admitted on request to the superintendent. The military hospital has a capacity of about 200 and is also very poorly equipped. It is in charge of an Army medical officer, but receives men from both the Army and Navy. The Women's Hospital, for both women and children, has a capacity of about 100. The Spanish hospital, situated near the end of the south breakwater, is the best in town. It is a private hospital, run by subscriptions by the Spanish Colony, and is fairly well equipped. It takes private patients, mostly of the Spanish Colony; rates, $3 (Mexican) a day.

U. S. S. PADUCAH.

By E. E. Woodland, assistant surgeon, United States Navy.

Cape Cruz-Casilda survey expedition: This expedition is working among the myriads of cays or all sizes and shapes which compose this region. The cays are of coral formation; uninhabited except occasionally by fishermen; are covered along the water's edge

or completely with dense mangrove growth, which has to be chopped through in many instances to secure a footing or path for tower parties. The only foliage that grows is the predominating mangrove, and occasionally, on the larger cays, a few palms and the gua tree (poisonous). Fresh water does not exist on many of the cays, and the supplies for camping parties must be sent along with them when it becomes necessary to remain upon them for any length of time. Animal life consists of sand flies and mosquitoes, which live upon the juices of the mangove, the iguana, and a few types of birds which are of the fishing class.

The anchorages of the expedition are selected in order to bring the base as close as practicable to where the work is to be done, and to have protection for the barges from rough weather. These anchorages are usually located from 10 to 40 miles from the mainland, and often much farther from the mail and supply base with which communication is kept up through the ship, launches or an employed sailing schooner, and the frequency of this communication must depend upon the distance from the base and the weather conditions. During the period covered by this report we have been working to and fro near Santa Cruz del Sur and Jucaro, Cuba.

Jucaro, Cuba: Base of supplies for barges Nos. 1 and 123 from April 21, 1913, to June 10, 1913, and for the whole expedition from November 10, 1913, to December 31, 1913, and will probably continue to be the base of supply until the latter part of this season's work. Jucaro is the southern terminal of the Jucaro & Moron Railroad. It is a typical fishing village of from 300 to 400 people and the tidewater outlet of a large sugar production, which is brought down by the Jucaro & Moron Railroad. The population depends upon the catch of fish, which are packed in ice daily and transported inland, and in the shipping season upon lighterage, the natives acting as stevedores for that which has to be done for all the sugar-transporting steamers. There are two fair stores which supply the steamers with provisions. The railroad which runs directly across the island is efficient and well equipped and runs a passenger service each way daily. It connects with the main Cuban railway at Ciego de Avila, which is 20 miles inland.

Jucaro has no sanitary facilities of any kind and is surrounded by the usual filth of this type of port on the southern coast of Cuba. The water supply is obtained from the rains drained from the roofs and stored in wooden tanks. Privies are built so that they project over the sea near the edge, and these are the principal means of disposal of feces and urine. No medical facilities exist, as there is no doctor in the village, and the nearest one is 18 miles inland. There is a small drug store; the druggist treating what cases he is able to handle. The water approach to Jucaro is only of from 7 to

8 feet depth for a distance of 5 miles out; thus the ship can not get very near the port. No prostitution exists.

Ciego de Avila, which is on the railroad about 20 miles inland, is in reality the supply for a part of our fresh provisions for the ship through Jucaro. Meat is killed at Jucaro and sent out as soon as possible. Ciego de Avila is a place of 3,500 to 4,000 people of the usual Spanish type. The people seem to be unusually active for a Cuban place, but their sanitary conditions are disgraceful in comparison with the other progress and, further, they do not seem to appreciate the necessity for any sanitation. They have no waterworks or sewerage system. Water is obtained from the rains and stored in wooden tanks. Privies abound, and where any toilets exist the leads go to reservoirs which have to be pumped out from time to time. The conditions are well illustrated through the constant circling of buzzards over the town and seeing them in the back yards and perched on the fences of the private homes. The hospital facilities are practically nil and of crude and dirty type. There is one place only that is called a hospital, but it has little semblance of one; it has 30 beds and only men are admitted. The Cuban administration issued an order July 1, 1913, doing away with licensing and segregation of houses of prostitution and the medical inspection of prostitutes. This has had anything but a satisfactory result, since prostitution is quite as common as before the order, and now the houses are scattered throughout the place, and every driver knows where to locate them. Now there is not the triweekly medical examination of the prostitutes and protection gained therefrom. Last season the venereal conditions through segregation and medical inspection gave very good results so far as our effects showed. It is questioned seriously but that they will be different this season. Limited visiting parties, under a patrol officer, were permitted to go to Ciego de Avila for 24-hour periods, being a part of Saturday and Sunday during November, there being about three such limited liberties, involving probably 50 men in all. A few cases of chancroid and one case of syphilis have developed as a result thus far.

Kingston, Jamaica: Permission was granted to visit this port for the first general liberty of this season, and the ship remained there from December 26, 1913, to January 2, 1914.

Kingston has been reported upon from numerous sources; therefore I will confine myself to the direct effect upon the health of this vessel. Mumps existed in epidemic form, but no quarantine measures were taken, and these cases could be seen everywhere. It is expected that we will have some cases develop from infection while there. At the present writing (Jan. 9, 1914) the incubation period has not passed since the first liberty party went ashore December 26, 1913. Prostitution is confined to the native Jamaican women, but it is

wide open and under no restrictions of any kind. It is certain that 12 cases of chancroid and one of gonorrhea have developed as a direct result of exposure of our men. Any further consequences can not yet be foreseen.

Insects: Cockroaches breed on board the ship and barges and seem almost impossible to exterminate in this region. Flies do not bother us, except those coming from barge No. 1 at certain times. Sandflies, which abound on most of the keys along with mosquitoes, make the lives of the tower and camping parties miserable, being so bad at times as to force the men into the water for protection. The sandfly bite produces an intensely itching papule about one to three days later in addition to the immediate discomfort; the papule lasts about a week and is often associated with ecchymoses. Immunity can be obtained to the effects of these bites. Oil of citronella and alcohol (equal parts) applied to face and hands, carefully avoiding the eyes, seem to give the best results toward prevention from the pests. These insects are so isolated from inhabitation that they are not considered infectious nor have any cases occurred that could be attributed to these bites. Scorpions sting the men sometimes while working on the mainland, but the sting does not amount to much more than that of a wasp.

Infections local and general: Local infections begin just as soon as the expedition arrives upon the grounds and continue throughout the entire season. The statistical reports do not show the extreme prevalence of these conditions, because a great many are able to continue their work under treatment. The common origin of these cases of cellulitis is about hair follicles, and they begin at some point where pressure or friction of some kind is associated. They nearly all are of greater extent and with freer production of pus than is seen in the United States. The organisms are the staphylococci. Wounds of slight nature and blisters, if neglected in the least, follow the same course. Furunculosis is another common condition that affects some almost continually while here. The diet, plus the general character of staphylococcic infection in the Tropics, is supposed to be responsible for this condition. All sorts of means for controlling these infections have been tried, such as use of antiseptic powders, shaving areas commonly infected, use of tonics, alteratives, etc., but with little success. At present the vaccine treatment furnished by the United States Naval Medical School will be tried on the severe cases. One case of streptococcic infection, general in character, resulted from a barber cut on upper lip while in Cienfuegos, and proceeded rapidly to a meningitis and death, regardless of every effort to control the virulent infection. It is understood that these cases are almost always fatal in Cuba, where an early amputation can not

be done. For the above reasons a great many bandages and articles for dressing septic wounds are required.

Skin conditions: Food rashes and urticaria are common and are frequently associated, the common cause being believed to be due to gastro-intestinal autointoxication, since a majority of the cases appear after having eaten ashore of the highly seasoned tropical dishes to which they are not accustomed. Tinea cruris (Castellani and Chalmers) is common, and is supposed to be transmitted by underclothing; but this point has not been proven. The crural region is the only part affected. In the acute stage it responds rapidly to one to three applications of tincture of iodine (U. S. P.)

Gua poisoning (*Rhus metopium*): Less trouble has been experienced with it during the past year. The tree does not exist except on the larger cays and on the mainland. The men are familiar with the possibility of this condition and have a wholesome dread of the tree. The older men know the tree and carefully avoid it. A prophylactic bottle of alcohol, with tincture of green soap, 1 oz. to the pint (to prevent drinking), is given to boats and expeditions. Base-line parties suffer mostly. Numerous minor cases occurred, and for this type solution of picric acid seems to control the intense itching. The men get their hands infected with the toxin in clearing spaces by chopping down trees and then, on urination and defecation, transmit it to the genitals. One case of severity occurred requiring treatment in bed for three weeks. The symptoms consisted of rapid edema of all loose tissues, penis, scrotum, under eyes and face, hands, arms, feet, and legs. Vesicles rapidly appear generally and cover the edematous part, being pronounced on the trunk. Fever, at first, varies from 100.5° to 101.5°. Itching is almost intolerable, making sleep almost impossible and so upsetting the nervous system that relief must be given. The vesicles usually become infected with staphylococci, and from the absorption from the numerous foci the typical hectic fever develops, lymphatic glands become swollen and tender, and other toxemic symptoms are in evidence. Treatment: Eliminative and dietetic; local applications of analgesic ointments and powders; evaporating lotions to edematous parts (alcohol 2 oz., water 14 oz., has given most comfort); immersion of whole body in an antiseptic bath, followed by the analgesic and antiseptic powder; tonic treatment for convalescence. Morphine has to be used, at times, in the early stages, to control itching, sleeplessness, and nervous symptoms.

Eye conditions: The refractive errors and complications are a source of considerable trouble with little relief to be had. The glare of the water, constant use of sextants, protractors, and instruments of precision soon bring forth trouble among the officers and men working under these conditions of eyestrain. Belpharitis and a con-

tinuous series of styes appear. Headaches, dizziness, and inability to read are complained of. Examination shows 20/20 or more with some degree of astigmatism. On the survey grounds the only relief rests in splinting the eyes with atropine or else changing the detail of work. In an endeavor to clear this condition, if possible, Surg. D. N. Carpenter, United States Navy, examined a good many of the cases. He reports "practically every case shows asthenopia of considerable degree associated with astigmatism, which is usually of minor degree." Colored (light amber) goggles have been furnished the expedition, but the men can not work in them on account of interference with sight, and further, they get covered with salt-water spray which clouds the glass, and no time is available to clean them while taking angles in rapid succession. These goggles are furnished with metal side guards which rust from action of the salt water. Their only practical value consists in use going to and from in the boats before the actual work of angle taking begins and for those not using instruments.

Ear conditions: Otitis media and otitis externa, while not causing much disability, are troublesome conditions that are productive of later defective hearing. Old cases, apparently cured, light up and new ones develop which require prolonged and persistent treatment. Swimming does not seem to be as much a cause as supposed last year, and therefore they must be classified as to cause along with the prevalence of staphylococcic infections.

Teeth rapidly decay in the Tropics unless all minor cavities are protected. The fearful condition of the teeth of the natives fully illustrates this point. Especial attention was given to the teeth of the crew before this season's work began, and some result has been seen in consequence.

Respiratory conditions: Respiratory cases do not do at all well in this climate of the survey field, as has been shown by experience on this expedition and further by the morbidity rate of Cuba. Tuberculosis is very common on the island and at present is responsible for the greatest mortality. The humidity is supposed to have a great influence on these conditions. It is recommended that no apparently cured cases of chronic respiratory diseases be accepted for prolonged duty in this region and that careful examination of the crew prior to sailing be made to eliminate any incipient or suspicious cases.

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1914

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This United States Naval Medical Bulletin is published by direction of the department for the timely information of the Medical and Hospital Corps of the Navy.

TRUMAN H. NEWBERRY,
Acting Secretary.

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PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, medical department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service not only will they be employed to some purpose as merited but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

W. C. Braisted,
Surgeon General, U. S. N.

U. S. NAVAL MEDICAL BULLETIN.

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SPECIAL ARTICLES.

ECONOMY AND WASTE IN NAVAL HOSPITALS.

By E. M. SHIPP, Surgeon, United States Navy, and P. J. WALDNER, Chief Pharmacist, United States Navy.

At this time of almost universal awakening to the need of scientific management in every industrial and business organization, brought about largely by the ever-increasing cost of material of all kinds, it may be appropriate to say something about economy and waste in naval hospitals, and to look into the fundamental reasons for a failure to observe those small details of economy or thrift that contribute to profitable business in civil institutions and which have been so carefully studied and applied by those striving for efficiency, as that term is now understood, namely, the most effective utilization of material and getting the fullest earning power of a reasonable working day, with the complete elimination of waste of either material or energy. The problem of waste is not confined to naval hospitals by any means; anyone familiar with the literature dealing with civil hospitals knows that this is one of the most perplexing questions of such institutions. A reformer meets with opposition in almost any line of work, but in a hospital he has a sentimental factor of far-reaching influence to contend with, in that he is always confronted with the very true but much overworked platitude that nothing is too good for the sick, and is often halted in conservative measures for economy by the thought that he may be charged with responsibility for neglect of the sick or failure to provide everything in his power for their well-being. There are, however, other conditions peculiar to the Navy that contribute to wastefulness and which, it is believed, admit of improvement. The military nature of our institutions should give force to remedial measures. The underlying causes of extravagance or, we may call it, want of consistent thrift, in our hospitals, are believed to be the following, given in the order of importance of their bearing on the result:

(*a*) Absence of any tangible reward for, or recognition of, superior efficiency, both individual and institutional.

(b) Absence of systematic routine inspection and checking in detail of expenditures and stock by a representative of the Bureau of Medicine and Surgery.

(c) Leniency in dealing with offenders in the matter of extravagance and waste.

(d) Tendency to overstock and thus accumulate dead stock which deteriorates, and present methods of replenishing stock.

(e) Absence of any allowance schedule in any class of hospital supplies and equipment.

(f) A service tendency to overlook the importance of heat, light, and water as factors in the cost of hospital maintenance.

(g) Shifting personnel.

(a) The inauguration of steaming and fuel combustion competitions and the establishing of prizes for winners was perhaps the first practical step in recognition by the Government of the value of the personal element, down to the most humble unit, in matters of economy and the importance of getting all possible out of the dollar expended. Unfortunately, there is to-day nothing in the Medical Department in the form of a trophy or reward to stimulate competition among the hospitals and to encourage medical officers, enlisted men, and nurses to endeavor to make the best record for efficiency and economical management. While we like to feel that everyone does his duty for the sake of duty well done, experience shows that this sentiment is not productive of economy, and that a scheme of competition that will distinctly mark the winner would be of far-reaching benefit. If some form of trophy or reward were available it would develop the habit of thinking of economical measures on the part of everyone, and officers particularly would become more observant of waste and check it. It is thought that a practical way can be found for determining, as nearly as the peculiar conditions of hospital expenditures permit, which institution has done the best work during the year. Several schemes have been considered, but one that seems most feasible and fair is a classification of all our hospitals into three groups, each hospital taking its place in a class, not by bed capacity, but rather by work done; and for the determination of this factor there appears to be no better index than the number of subsistence days during the year. In this way three classes could be formed, say class one, of hospitals having 60,000 days or over; class two, 25,000 days and not more than 59,999; and class three, 24,999 days or under. To the hospital in each class having the lowest daily cost for subsistence and maintenance averaged, combined with general excellence, determined by careful routine inspection made by a bureau inspecting officer, a suitable trophy of some type could be awarded, to be displayed in a conspicuous place in the hospital lobby for one year—this to be the

prize for general excellence. It is believed that the question of the lowest average number of days under treatment for patients in hospitals should be given an important place in determining general excellence. This is considered to be a very important matter, not only from the standpoint of institutional efficiency and economy, but as affecting the military efficiency of the Navy. Perhaps ultimately a plan may be evolved which will give to each individual some small personal reward; but at present nothing of this nature seems practicable.

(*b*) In order that the quality of the hospital service and its maintenance may not be sacrificed to undue economy, thus involving deterioration in the plant and character of the food provided, it is obviously essential that any scheme of competition must be controlled by a system of searching inspections. There is at present a variation in the cost of the daily ration at the various hospitals so wide as hardly to be explained by the difference in the nature of the cases under treatment, and variation in local cost of provisions. It is a well recognized fact that certain hospitals furnish better food than others. There should be no great difference; however it is safe to say that this matter has not been the subject of close scrutiny. Regarding drugs, dressings, and the many other items of maintenance for laundry and cleaning purposes in which the waste is unquestionably most extensive, there being no schedule of allowances, it has heretofore been manifestly futile to make any inquiry into the amount on hand of any given item of supplies during an inspection, or to check the stock books with a view to ascertaining whether or not expenditures have been made with due regard to economy, or whether the amount of stock on hand is excessive or not for the simple reason that no standard exists.

In a business house the profit or loss account soon gives assurance or warning, as the case may be, that the establishment is or is not being conducted on businesslike lines, but in an institution such as a naval hospital, where there is no income to be balanced against an expenditure, it is difficult to determine this fact with any accuracy, and for this reason schedules of allowances and actual checking by an inspecting authority are entirely proper and should not be regarded as a reflection on the efficiency or integrity of anyone concerned; the end sought being simply a more systematic business management in harmony with more advanced ideas and standards of thoroughness.

(*c*) In General Order No. 234 the department has emphatically called attention to the laxity in dealing with losses of Government property and established rules for fixing responsibility for missing articles. It is believed that this measure will go far toward inaugurating systems whereby some one individual will be charged with

responsibility for certain articles thus covering the entire equipment of an institution. It is of course not within the province of this paper to discuss methods of dealing with offenders in matters of this kind; their responsibility for waste and loss can be fixed only by means of an institutional system of checking, the details of which must be worked out locally.

(*d*) Several factors enter into the tendency to accumulate large quantities of stock, particularly in linen, mess gear, and drugs. First of all is the primitive instinct to get all one can and the commendable desire to be ready for any emergency; but it is believed that the most potent cause is the practice of making requisitions for articles on Form B at such long intervals as six months and for linen and mess gear only annually. Altered conditions of the service, the market, and transportation facilities seem to make a change in this matter advisable. The parcel post in particular affords facilities whereby quick delivery of small quantities of material can be effected from the supply depot at no cost whatever to the Navy appropriations. Incidentally it might be stated here that Form B is not well adapted for making requisitions from hospitals, chiefly for the reason that it embodies many articles that should be made in the hospital and many more which are intended primarily for ships. Six months or a year appear in perspective as very long periods of time, in which anything may happen, and the tendency is to err on the side of safety, with the result that large quantities of stock are laid in which may never be used or are certainly in excess of any reasonable requirement. This is exemplified in the case of certain drugs that may be extensively used by some medical officers for a short time, and upon their detachment this material is allowed to remain in the storeroom until it deteriorates through age. Aside from this, however, even granting that the stores laid in are nonperishable, account should be taken of the large amount of money indefinitely tied up with the prospect that some day the article will have altogether deteriorated through age or become obsolete. A careful inspection of many of the drug storerooms of our hospitals would undoubtedly reveal a considerable sum tied up or wasted in drugs which ought never to be used, even though from external appearance they may seem to be good. In rubber goods the percentage of loss by deterioration from age is very large, and so it is with blankets unless they are carefully protected from moths. Enough has been said to show that the practice of overstocking is costly and far-reaching when considered as a whole, including all our hospitals. The remedy is believed to lie in making more frequent requisitions for such quantities as are required to meet the known needs of the hospital. This may make more work, but the time will be judiciously spent. No opinion is ventured as to just how frequently requisitions should be made from hospitals, as consideration would

have to be given to the supply depot facilities, freighting, and other factors.

(*e*) There being no allowance schedules, either in money allotment or quantities of any item in hospital equipment or supplies, it is difficult for the commanding officer to determine accurately, when the number of items is so extensive and various, what constitutes a normal consumption for an institution, and this difficulty is even greater in the case of a checking authority. With the data of many years available, it is believed that some kind of limitation can safely be established, basing some of the items on bed capacity, namely, items of nonperishable character, while perishable items might be based on sick days, taking as a standard an average of the preceding five years. If such an allowance scheme were in operation, it would prevent not only undue consumption, but the more costly practice of overstocking. Moreover, the junior medical officers would be in possession of a standard of expenditures in those items over which they have control, and thus again the need for retrenchment would be ever in mind.

(*f*) The annual report of the Surgeon General of the Navy for 1912 shows that the sum of $759,925 was expended last year for maintenance of the hospitals under the control of the Bureau of Medicine and Surgery, and of that sum $143,271, or 18.8 per cent, was spent for coal, electric light, and water. It is evident, therefore, that this is one of the most important questions that we have to deal with in hospital administration, and that here at least is a big field for scientific management, with a fair prospect of being able to accomplish a good deal in the way of economy. It is a well-known fact to everyone who has served in hospitals that many more electric lights are burned daily than the actual needs of our institutions require, and that standing lights are frequently allowed to remain burning long after the sun is high in the heavens. To overcome the waste and extravagance in this department, the number of lights actually required to properly light the various parts of the hospital should be carefully determined and nothing in excess of this number should ever be allowed. Furthermore, suitable hours for turning on and off the lights, especially standing lights, should be established, and offenders against the rule should be promptly called to account. A further substantial saving can be effected through the use of the tungsten wire filament bulbs, which are far more economical in the long run than the old type bulb, although the initial cost is somewhat greater. In the case of steam heat and coal consumption it seems to be the rule at most institutions to allow the steam to remain turned on in the buildings during the winter months regardless of what the temperature of the outside air may be. Then, again, the amount of steam pressure to be carried in the boilers is frequently

left entirely to the judgment of the fireman on watch, with the result that often the coal consumption is in excess of the amount actually needed to heat the buildings. It is believed that careful attention to the following details would result in a considerable saving in the course of 12 months: First determine the most economical steam presure that will heat the buildings, run the laundry machinery, the pumps, etc., and fix that as the amount beyond which the pressure must not be permitted to rise; all steam pipes to be properly lagged; feed water to be injected into the boiler hot. Furnaces to be fired evenly, and when posible a daily limit of coal consumption to be fixed. The temperature of the hospital buildings to be watched and an upper and a lower temperature limit to be fixed. beyond which the steam heat is to be turned off or on as required.

The third item in this group is water consumption, and it can be said without fear of contradiction that there is no limit upon the water consumption of our hospitals. In fact this is a matter that receives little or no attention, with the result that water is freely used and wasted year after year. It may not be amiss in this connection to say that the question of consumption of coal, electricity, and water is receiving the closest possible attention on every vessel of the Navy, even to the extent of requiring officers to turn the lights out in their staterooms when not actually occupying them, in consequence of which an enormous saving has been effected. If the same methods were adopted at our hospitals it would seem to be not unreasonable to expect that a saving of one-tenth of the present expenditures could easily be made which would amount to about $15,000 in the course of a year.

(*g*) Shifting personnel in all departments of our hospitals is an inevitable corollary of military organization, and while a permanent force is most desirable for efficiency it is impracticable and therefore idle to discuss. There is always a definite relative proportion of the hospital personnel due for detachment, transfer or discharge. Experience shows that of these there are always some who lose interest in their work toward the end of their service in the institution with more or less consequent loss in efficiency. Moreover, by the separation from the institution of officers, certain practices and policies which contemplated the use of material already provided may be discontinued or altered, and such material may thus be rendered useless. This condition seems to emphasize the advisability of modifying the present practice of making requisitions semiannually. previously referred to in this article, and obtaining stores in anticipation of future needs based solely on the experience of the past. There is no doubt that the practice of laying in a reasonable quantity of supplies with a tendency to run short rather than over, is a very effective element in economy particularly in our hospitals where

such replenishments do not involve purchase in small quantities inasmuch as supplies are obtained largely through supply depots. Broadly speaking, economy is fostered by the knowledge that the supply is not unlimited and is hedged about with restrictions. Easy come and easy go applies here as elsewhere.

Thus far the discussion of the problem has been along general lines, but there are certain departments or classes of items which it may be appropriate to deal with in detail, there being certain features connected with each which, while not entirely new or original, will bear more extended discussion.

DRUGS: It is quite safe to say that throughout the service there is a want of appreciation of the fact that drugs and medical supplies are expensive; that certain drugs are exceedingly costly and that the dispensaries of our hospitals, being under no restrictions as to allowance, are extravagantly conducted. This is due to several causes. First, no one person is solely responsible for expenditures, and no one person is in undisputed charge of the dispensary; furthermore, too many people usually have access to the drugs. Order books are made up in wards largely by nurses and hospital apprentices who know nothing about cost, keeping qualities, or appropriate quantity to be ordered, and these orders are signed and thus made mandatory by a junior medical officer who does not always scrutinize as carefully as he should an order which may run into several dollars any morning. The most common fault is to get medicines in quantities entirely in excess of immediate needs; thus it is that one sees any number of half-used bottles of stale solutions and mixtures in every ward and dressing room. These are generally a total loss, or might be used when they are no longer fit for use, and under such circumstances would be a source of danger. The same condition holds true for tablets and powders. It is firmly believed that more medicines are wasted than are actually used. In the storeroom, as a result of overstocking, there is apt to be an accumulation of drugs and medicines of uncertain age and quality. It is believed that many of the abuses in the drug department would be corrected if each package of drugs was stamped with the date of receipt and a daily report was made to the pharmacist by the hospital steward in charge of the dispensary of all liquors, alcohol, expensive alkaloids, silver compounds, and such other drugs as may be designated that have been expended during the preceding day. This would give competent supervision and develop a system of checking expenditures whereby the executive surgeon could be informed at any time of excessive use of drugs in any department of the hospital. There is yet another phase of the drug question which it is believed is not generally recognized, but if properly developed would result in a substantial saving of the funds of the Medical

Department. This is the matter of alcoholic preparations, particularly soap liniment, tincture of ferric chloride, and other tinctures which are used in comparatively large quantities. A civil institution would save very little by making these preparations, but the conditions are entirely different in our hospitals. When these preparations are bought by the supply depot their cost includes not only the usual profit, but also the internal revenue tax of over or about $2 per gallon on alcohol. The medical departments of the services get their alcohol tax free out of bond or at approximately one-fourth of the trade price. It is therefore obvious that such articles should not be supplied to naval hospitals when they can be made so much more cheaply, and beside save the very material cost of the transportation charges of a lot of carefully packed and boxed bottles; moreover, this work would be excellent training for the men of the Hospital Corps.

Rubber goods: Rubber goods, particularly hot-water bags and fountain syringes, can never be as clean as hospital purposes demand, and the latter article particularly has few, if any, legitimate uses in an up-to-date hospital. This consideration and the increasing cost of rubber goods make it desirable to look about for other suitable appliances less expensive and more durable. Porcelain-lined irrigators, such as are now on the supply table, with perhaps a larger size, have everything to commend them as regards surgical cleanliness and attractiveness, can be readily sterilized without damage, last much longer in use, and do not deteriorate in the storeroom, whereas the rubber fountain syringe costs originally about 50 per cent more, is damaged by sterilization, and deteriorates rapidly when not in use. Hot-water bags are used more as bed warmers than for therapeutic purposes and when so employed could, with a substantial saving, be replaced by flat metal flasks such as are used extensively in Europe. They are indestructible, clean, and really attractive. These bed warmers are made of steel porcelain and are now listed by a prominent hospital supply house, but it is believed that a copper vessel would be more economical in the long run and is more attractive when brightly polished. The adoption of these metal flasks would cut down the expenditure for rubber hot-water bags enormously in the course of years. Rubber gloves are perhaps the most abused item of hospital necessities. It seems to be generally assumed that they are too delicate to make careful handling worth while. Here again the notion often prevails that operative work justifies extravagance. Careful treatment after use saves many gloves; in fact, as many operating gloves are ruined after the operation as in the actual work.

Commissary: A study of the statement of the cost of maintenance of naval hospitals in the annual report of the Surgeon General of the

Navy for 1912 reveals some interesting facts. It is found that the grand average of daily cost of subsistence at 15 hospitals which were in commission during 1911 and 1912 is only 1.7 cents more for 1912 than for 1911, the increase in the grand average being due to the higher daily cost for the smaller hospitals. However, in spite of the evident increased efficiency referred to in the preceding paragraph, there is still a wide variation in the daily cost of subsistence at the various hospitals, the difference between the highest and the lowest in this respect being 43.3 cents—practically double. Of course, the number of days' subsistence at these two extremes is widely divergent, but nevertheless so great a difference would seem to indicate that there is either waste and leakage or else the prescribed bill of fare has not been followed at those institutions having the higher daily costs. In any event there is indication that our system is not yet perfect at all hospitals.

Aside from possible losses due to illegitimate leaks, the commonest form of waste is food that is provided but not consumed. The rather fixed idea that all men, not on special diet, must have exactly the same portion of the same kind of food at each meal makes it necessary to provide a full meal three times a day for each man, although experience shows that a variable number of patients and Hospital Corps men will be absent for one or more meals every day. It is therefore safe to say that the daily loss and waste on account of no allowance being made for the liberty party is considerable. This is an important item in an institution with a large number of patients, and it is believed that advance information should always be given the commissary department by the office of the executive surgeon as to the probable number of persons who will go on liberty each day.

In conclusion it may be well to say a few words on the subject of money allotments for naval hospitals. It is believed that in some respects at least the allotment of a definite amount from the available funds for the maintenance of each institution would simplify the work of hospital administration, and if properly controlled by a system of searching inspections would result in greater efficiency and economy. The amount to be allotted each hospital would of course have to be determined by the bureau, based upon the estimated needs of the various plants, the necessity for repairs and improvements, and the amount of available funds. The commanding officer having been informed at the beginning of the fiscal year of the amount that had been set apart in the bureau for the maintenance and upkeep of the institution under his command would be in a better position to control and distribute expenditures in such a manner as to prevent waste and extravagance. It is believed that such an arrangement would stimulate wholesome rivalry among the various hospitals and

at the same time create a greater interest on the part of the medical officers in command. It can not be too strongly emphasized, however, that in carrying out any or all of the suggestions contained in this paper the need for careful, systematic, routine inspections by a qualified representative of the bureau is considered to be absolutely essential.

The following discussions of the above paper were submitted in response to a request from the bureau:

By C. T. HIBBETT, medical director, retired, United States Navy.

The general question of economic administration depends, to great extent, upon a proper organization of the personnel. This organization should extend from the commanding officer, through the executive officer, to all the departments of the institution, based upon department responsibility and accountability. With this general statement I would remark as follows upon the subject of economy and waste in naval hospitals, submitted by the Bureau of Medicine and Surgery:

(*a*) The establishment of a trophy or reward for work done in the three classes of hospitals outlined would scarcely, it seems to me, be altogether feasible. Trophy rewards may properly apply to institutions or organizations having practically identical equipment, such as battleships or other classes of naval vessels, Army organizations, etc., but in naval hospitals, where the number of patients and attendants varies so greatly from week to week, it would not seem practicable to render a just decision upon work done by the number of subsistence days during the year. Again, the lowest number of days under treatment might result in some detriment to the service in hastening patients to duty under conditions of competition for excellence of work.

(*b*) In reference to the utility of an inspecting officer as a representative of the Bureau of Medicine and Surgery from an economic standpoint I have serious doubts. Such an inspecting officer must be an expert accountant if he is to revise or criticize the economic administration of a hospital by the commanding and other officers under his command.

(*c*) General Order No. 234 should be observed as far as possible.

(*d*) I am in full accord with the opinion of the bureau that large amounts of all kinds of drugs need not be kept in store. This matter should be carefully considered by the executive officer at each hospital in reference to the drugs universally required by the profession and special drugs desired by the different members of the medical staff. Surgical instruments, appliances, and dressings should be furnished

in accordance with requisitions, without serious question on the part of the bureau. Frequent requisitions for supplies in small quantities would seem advisable, provided such requisitions can be filled without delay.

(*e*) I would not favor any fixed allowance schedule, based upon bed capacity of a hospital.

(*f*) Water consumption in a naval hospital should, in my opinion, be unlimited, provided it is not allowed to run to waste, with no results as to sanitation. The electric lighting may sometimes be a source of slightly unnecessary expense, but I do not believe that in a properly organized hospital it need be given serious consideration. The heating system in hospitals, if properly installed, as it is in the naval hospital at Norfolk, Va., under thermostatic control, can not be a source of serious money loss to the institution.

(*g*) Frequent shifting of the personnel in naval hospitals, while tending to the detriment of the institution, is not, in my opinion, a material source of extra expense to the Government.

Rubber goods: I do not know of any material that can properly replace the rubber hot-water and ice bags, rubber tubing for irrigators, surgical pads, and rubber gloves.

Commissary Department: In my opinion, the cost of subsistence in our naval hospitals, under the present high cost of living, is in no way excessive, and leaving out of consideration the tuberculosis hospital at Las Animas, it will be noted, from the Surgeon General's last report, that the cost of subsistence in the leading hospitals varies but slightly. Greater economy could be applied by the installation of a proper cold-storage plant. It is estimated, with careful computation, that with cold storage, including ice production for this hospital, approximately $4,000 to $5,000 could be saved in subsistence annually.

By G. A. Lung, medical inspector, United States Navy.

I have read with great care the article by Surg. Shipp and Pharmacist Waldner. There is not a statement in it as to fact, but what every officer of experience will agree to it. If the presentation of the paper lacks anything, it is that it limits the consideration of economy to hospitals, when we know that extravagance prevails throughout the entire workings of the Medical Department of the service. In hospitals, subsistence, lighting, and heating offer big outlets for waste but on board ship the waste through the extravagant use of drugs, surgical supplies, and equipment sometimes reaches the degree of prodigality. During my recent tour of duty as fleet surgeon, this constantly came to my notice. Hospital stewards and apprentices appear to have no sense of the money value of the ma-

terials they handle; it is one side of their training that is neglected. Clumsiness, carelessness, and lack of skill cause much loss or destruction. Thermometers and other glassware are too often broken: soiled linen is stowed away until it becomes mildewed and spoiled for further use. Towels are used for cleaning cloths, foot tubs are put to improper uses; valuable instruments are injured or destroyed by men not properly trained. Surveys involving the throwing away of such articles, and the requisition providing for their replacement, are too easily accomplished. There is room for great improvement along this line, both in training and responsibility.

As for rewarding hospitals for displays of economy, I think it impracticable for the reason that it would be difficult to establish a unit of comparison. The conditions mentioned in the paper militate against it.

This article should be given a wide circulation among medical officers, and they in turn impart it to nurses and apprentices, or others who come under their authority and its application.

The substance of it should be embodied in an official order.

Rivalry might be inspired if official reports were published showing the cost of maintenance of the medical departments of ships and hospitals, comparing one year with several preceding ones.

The financial table as given in the Surgeon General's report might be given greater prominence, and comparisons in years likewise be made.

After all it is not rivalry that will bring about the reform, but an emphatic display of the need; then the sense of duty in those responsible, backed up by an official pronouncement, will accomplish much.

THE NEW METHOD OF PHYSICAL TRAINING IN THE UNITED STATES NAVY.

By J. A. Murphy, surgeon, United States Navy.

A system of physical training based on the Swedish system in use in the British Navy has been under trial at several of the naval training stations in the United States for the past 14 months, and in connection therewith the following may be of interest:

The adoption of some system of physical upbuilding has been necessitated in the navies both of Great Britain and the United States by more or less similar causes, which may be put down as due most probably to changes in the type of ship, to possible deterioration or lack of maturity in the material applying for enlistment, and to great expansion lowering the standard of acceptance.

It is evident when general comparisons are made that sailormen of to-day are not the equal in all-around physical ability, general nim-

bleness, and lack of physical fear, of those who manned the sailing ships of former times, due probably to the fact that the life aloft strongly aided in the formation of these characteristics.

In examining various systems of physical training in order to find a substitute for this lost training as the modern ship developed, it was found that many were lacking in system, and that many of the exercises tended to distort the body rather than to develop it symmetrically or to make it other than massive in quality.

In the Swedish system was discovered a system on a scientific basis, adjusted to meet necessary faulty conditions, and suitable for the gradual physical education of the different types of the Navy personnel. Exercises which tend to exhibition movements alone or whose good or bad effect can not be clearly shown have no place in this system.

The Swedish system of physical training lays stress on the following points:

1. The day's order.
2. Progression.
3. Word of command.
4. Form.

The day's order (lesson) is an arrangement of the exercises in groups in a definite practically fixed relationship according to their effect from an anatomical and physiological standpoint, with the general plan of fitting the body parts gradually and progressively in turn to withstand the more severe physical strains which follow. This arrangement also prevents the exhaustion of one group of muscles by too long concentration of effort at this point. It provides also for a general work out at one time of all the various muscle groups of the body.

The different muscles are grouped in the following order chiefly because the effect sought in each instance is desirable, as mentioned above, from the anatomical, mechanical, and physiological standpoint.

Introductory: Composed of easy exercises serving to fix attention, loosen joints, and to warm up the body by mildly increasing the circulation in various parts.

Leg: Composed of exercises to stimulate circulation and nutrition and to improve nervous control in the important muscles of the lower limbs.

Span bending: An important set of exercises because of the effect on the thorax, which is cramped and fixed in most people unless exercises of this type are practiced. These movements contract the muscles of the back, pull the points of the shoulders back, stretch the muscles on the front of the chest, and bow the ribs forward as the spine is straightened. The abdominal muscles are toned up so as to counteract the tendency of the pelvic arch to drop downward in front

with the production of a hollow or sway back. The ribs are rendered supple and resilient and the heart and lungs therefore function better.

Heaving: Exercises strengthening the arm muscles and those attaching the arms to the body about the shoulder joint and shoulder blade. These exercises are harmful to a proper set-up, instead of being beneficial, if the head is permitted to droop and the chest to flatten with the points of the shoulder carried forward and inward.

Balance: Exercises training the nervous system to control antagonistic muscles with the least degree of energy expended. The result is conservance of endurance, grace and ease of action, and increased quickness and agility.

Dorsal: Exercises which strengthen the muscles of the spine and thus counteract the tendency to collapse upon oneself, so prevalent everywhere. Erection of the body with proper carriage is made easy to maintain.

Abdominal: Exercises which strengthen the abdominal muscles and raise the forward rim of the pelvic bones and correct thereby the condition of hollow back. Support is provided for the abdominal organs and congestion due to dragging prevented. The movements of this group also improve the functioning of the abdominal viscera.

Lateral: These exercises strengthen the waist line and increase suppleness in this region. They produce effects similar to the abdominal exercises. The resiliency of the thorax is increased and deformities of the spine corrected by equalizing muscular pull and increasing flexibility.

Jumping and vaulting: These exercises improve nervous and muscular control, judgment, presence of mind, physical courage and muscular team work. They teach an individual to handle himself in an awkward physical situation.

Breathing: Exercises given for calming effect after unusual exertion and as an exercise for the organs and muscles of respiration.

Marching and running: Exercises used to accustom the individual to use a free and easy movement in walking by their effect on the hip, leg, and foot positions.

Finishing: Exercises used to calm excitement following more or less violent effort, and as corrective exercises to overcome a tendency to faulty posture while the individual is engaged in exercises with the arm in the forward position.

Progression is provided by having a large number of exercises of each type, each one a step harder to accomplish than its predecessor. The effect is to avoid strain, either local or general. No exercise is used with the idea of producing size, the qualities sought being suppleness and agility. Strenuous effort is approached slowly, as the exercises are not used to test the limit of power. Prolonged effort

FIG. 1.—SHELF EXERCISE.

On the left: After one rank has mounted, lower rank jumps and grasps edge of shelf, is assisted by the upper rank to the third position, shown in figure 2. On the right: First position, mounting with assistance.

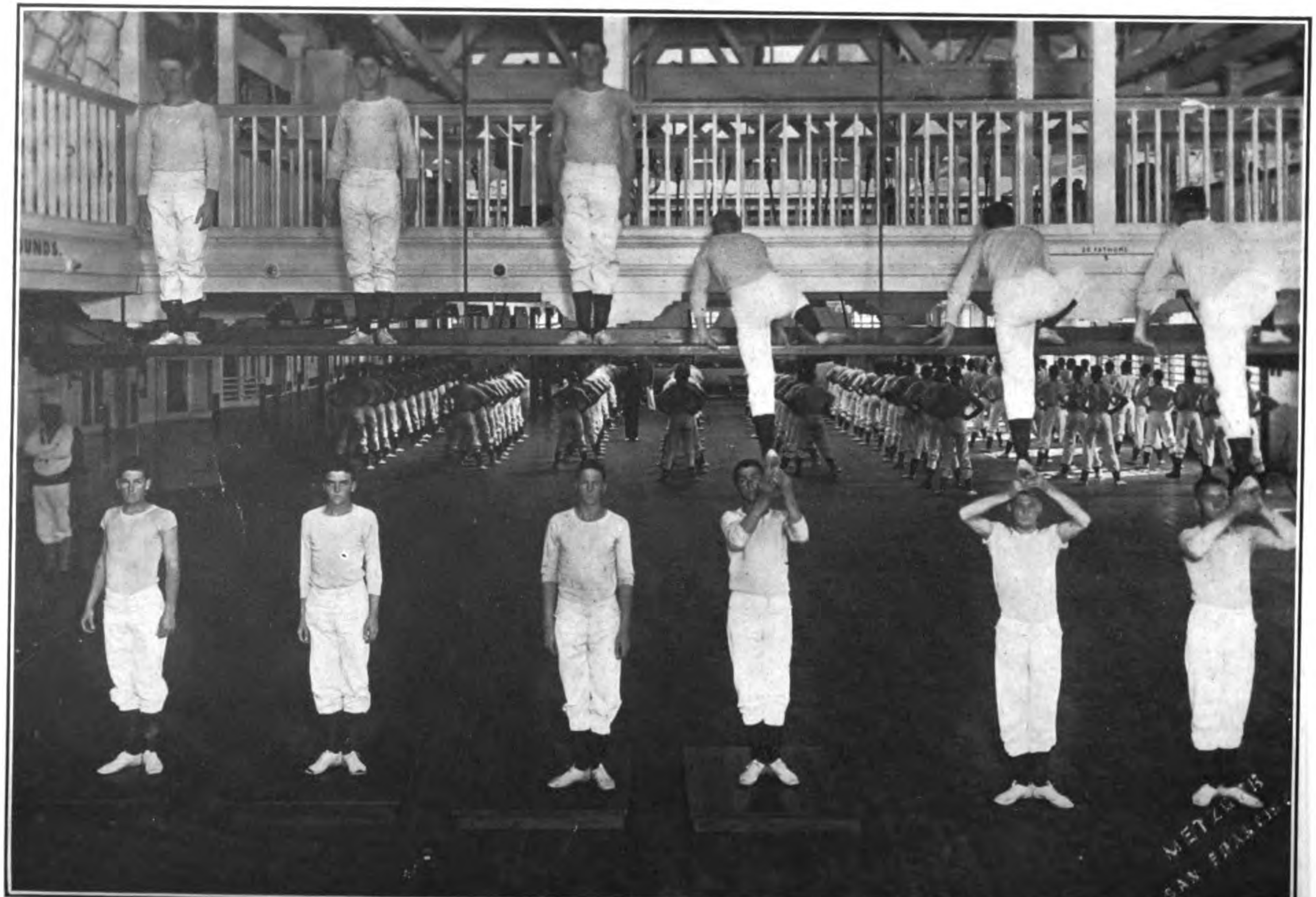

FIG. 2.—SHELF EXERCISE.

On the left: Fourth position, mounting with assistance. On the right: Third position, mounting with assistance.

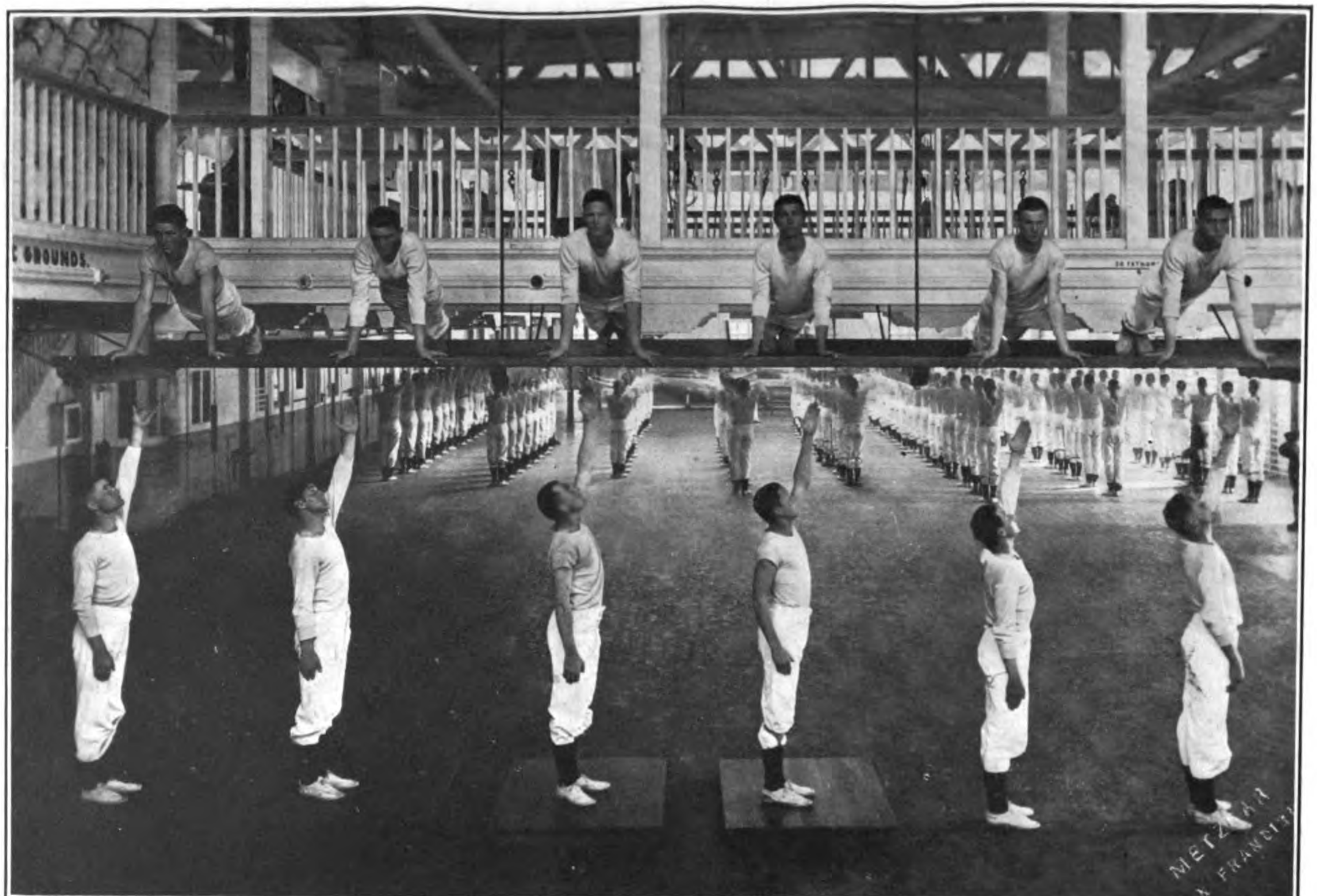

FIG. 3.—SHELF EXERCISE.
Upper rank dismounting, first position.

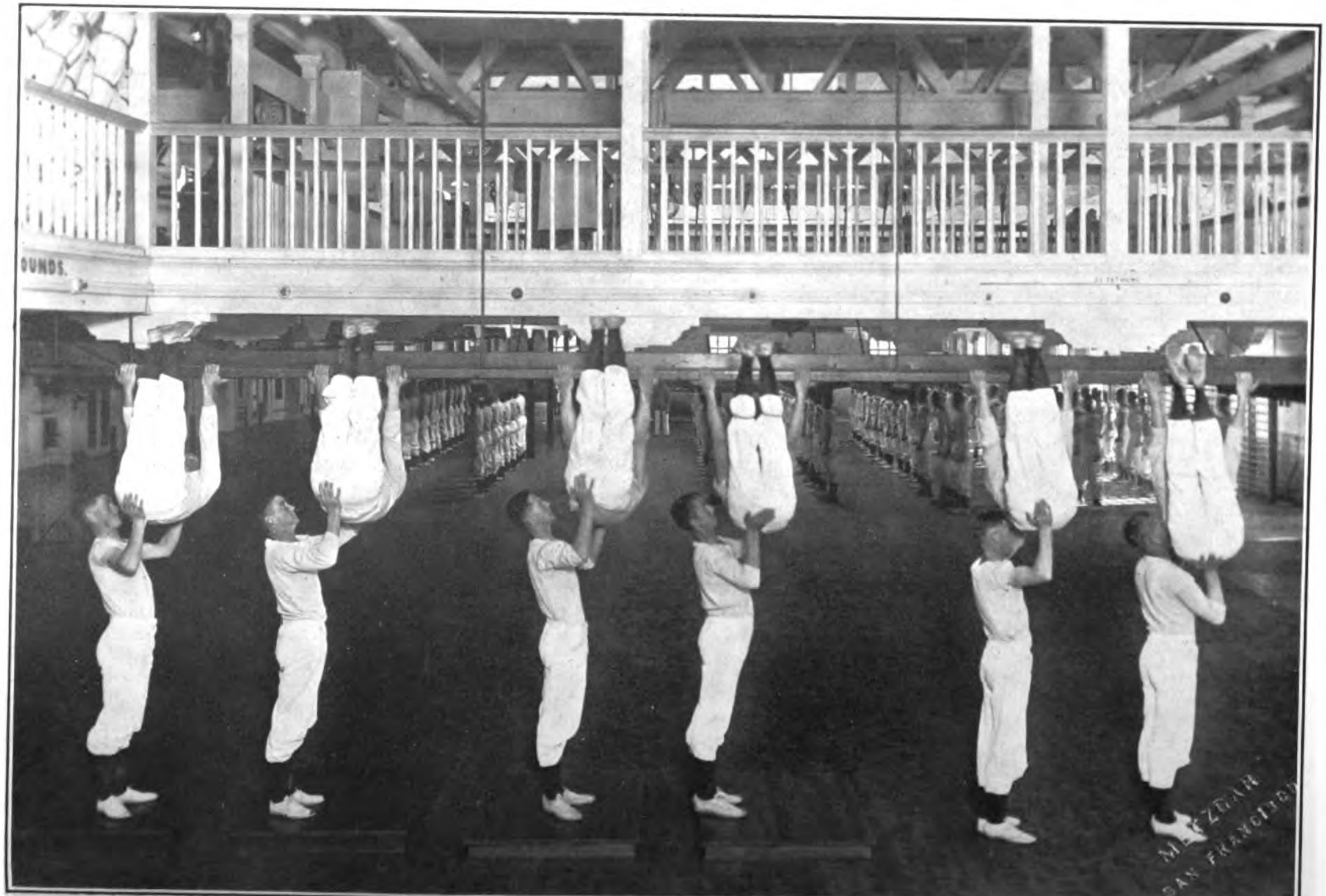

FIG. 4. SHELF EXERCISE.
Upper rank dismounting, second position.

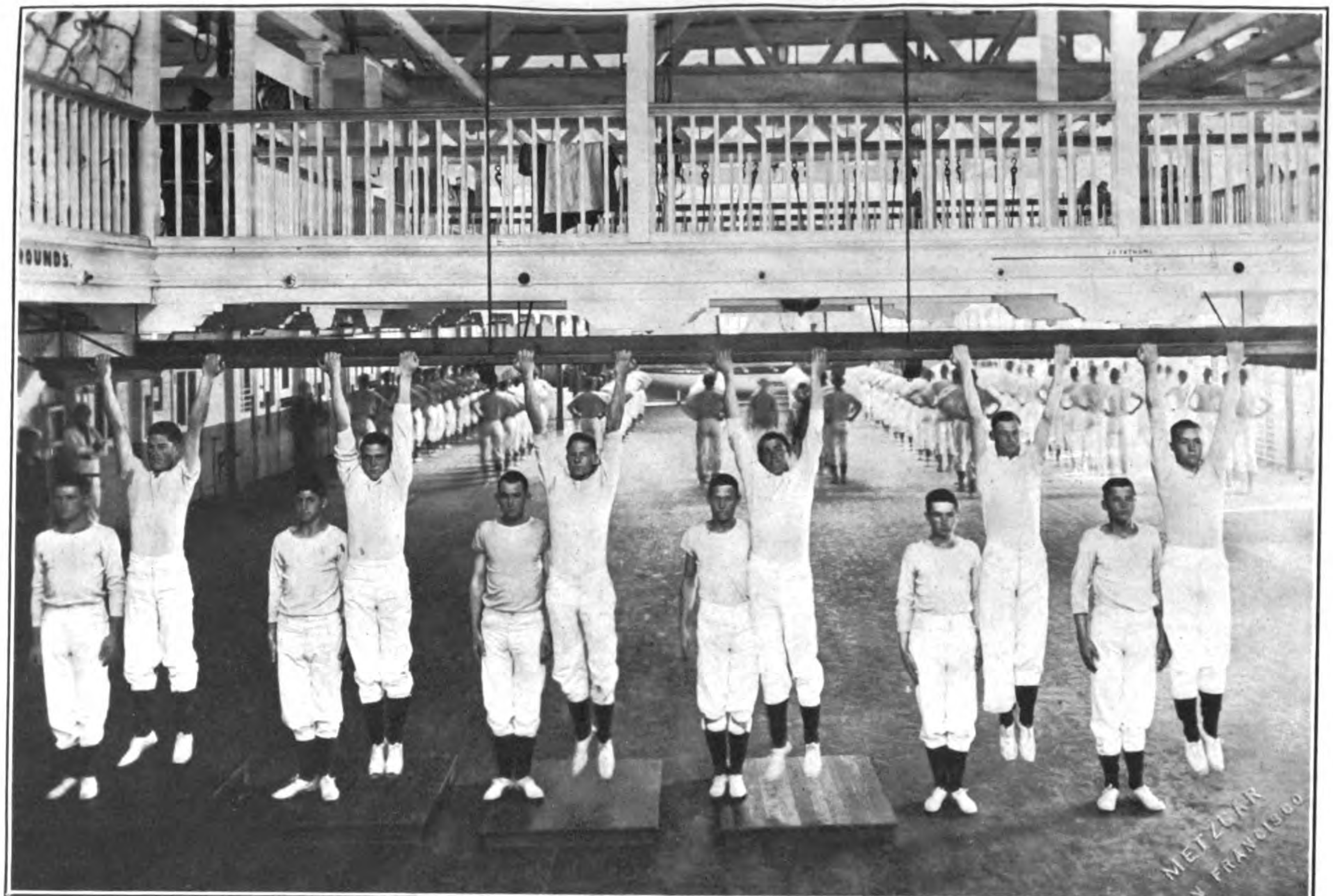

FIG. 5.—SHELF EXERCISE.
Upper rank dismounting, third position.

FIG 6. SHELF EXERCISE.

Both ranks on the shelf, front rank dismounting. First and second position. Third position of lower rank as in figure 5.

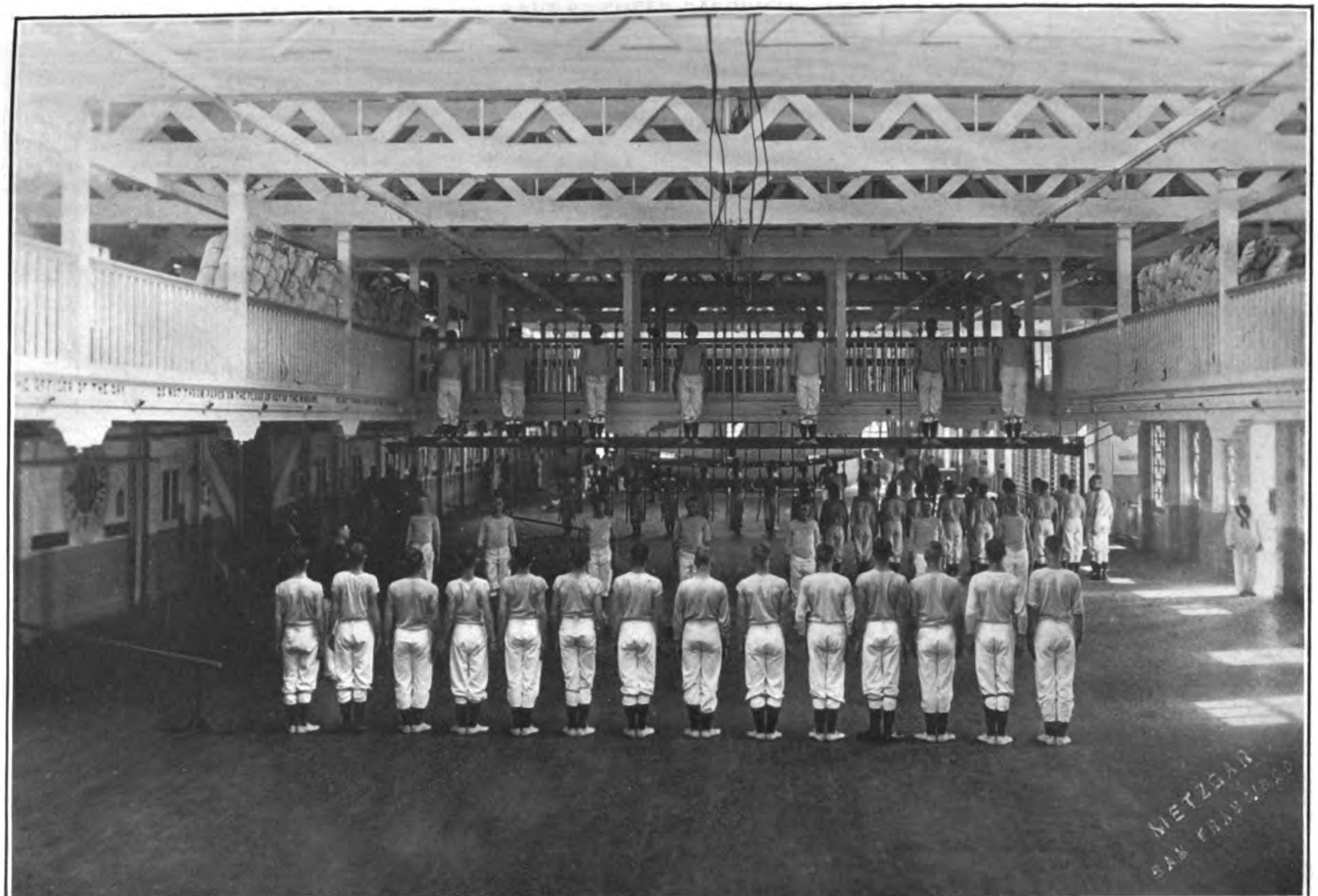

FIG. 7.—SQUAD DRILL ON THE SHELF, ROPES, BARS, AND BOOM

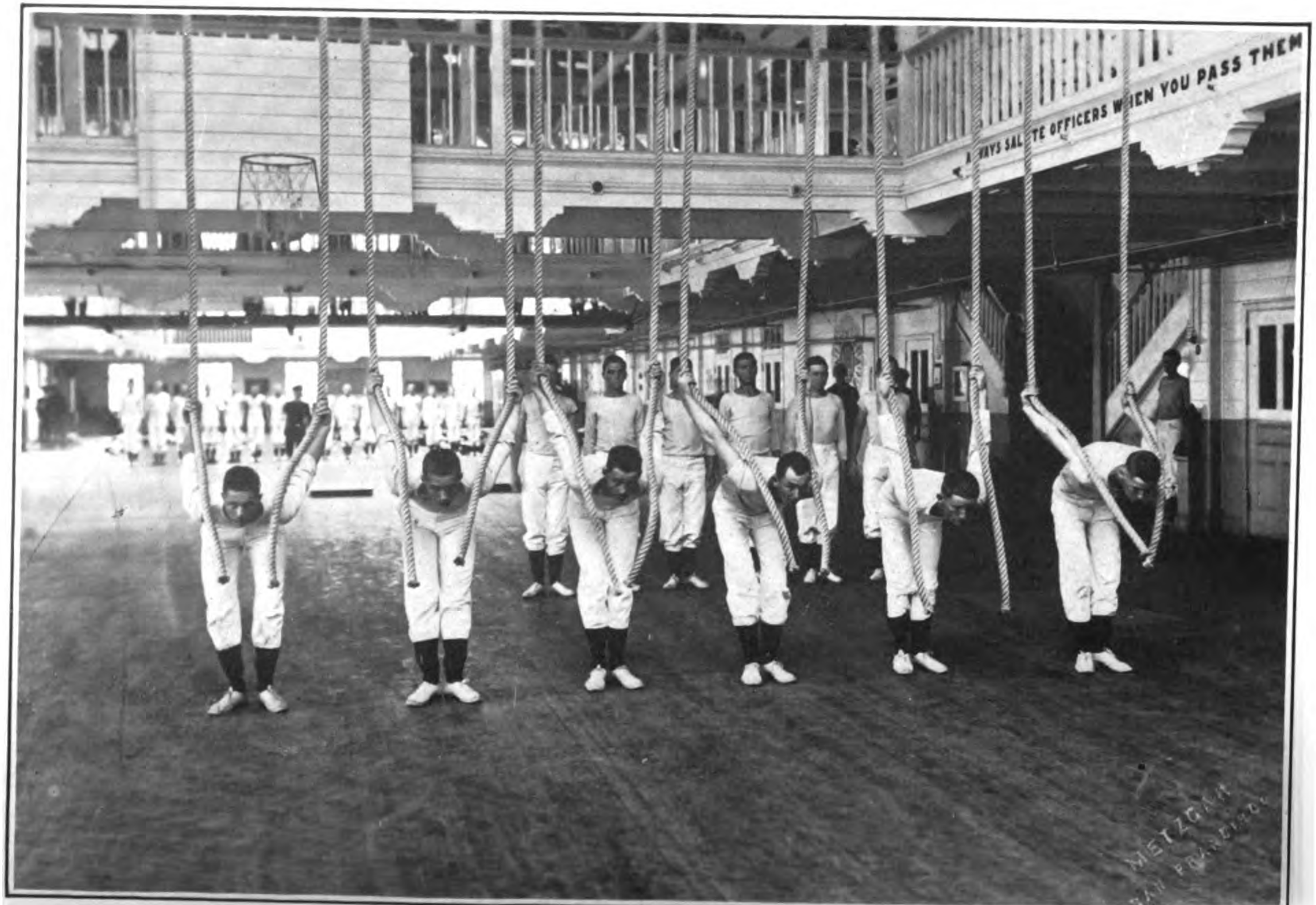

FIG. 8. ROPE EXERCISE.

Position shown is end of a circle movement near the floor.

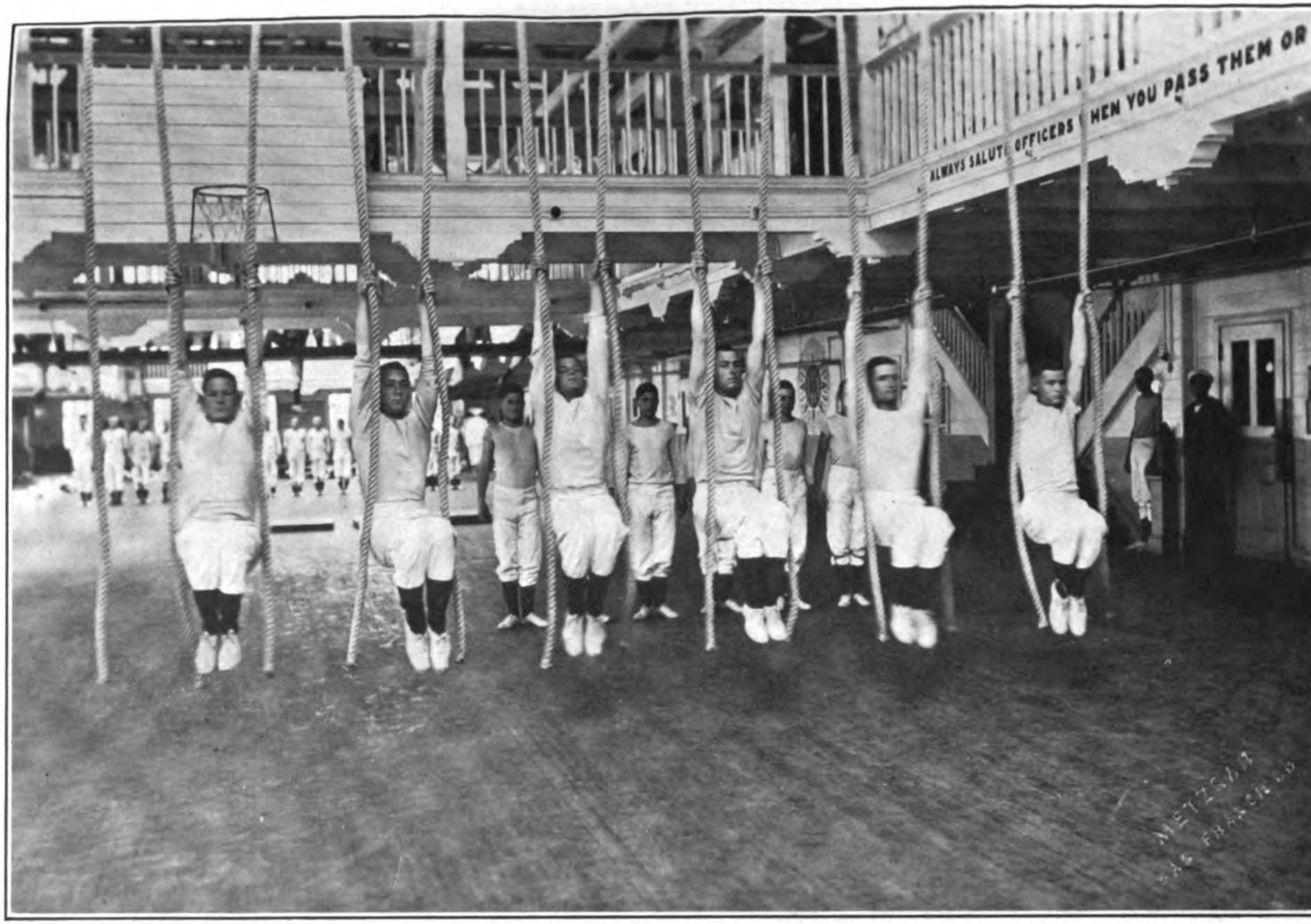

FIG. 9.—ROPE EXERCISE.

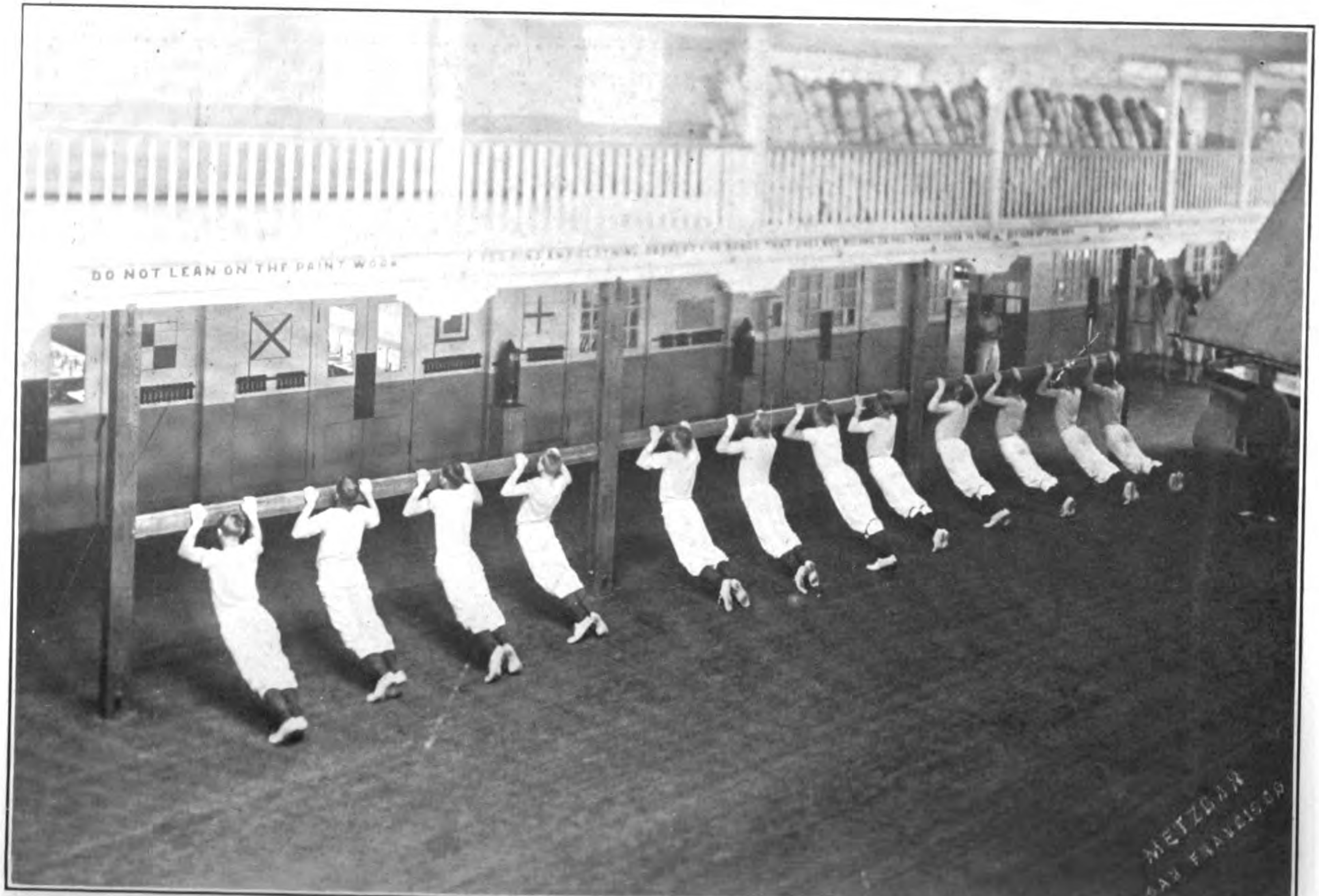

FIG. 10. BOOM EXERCISE

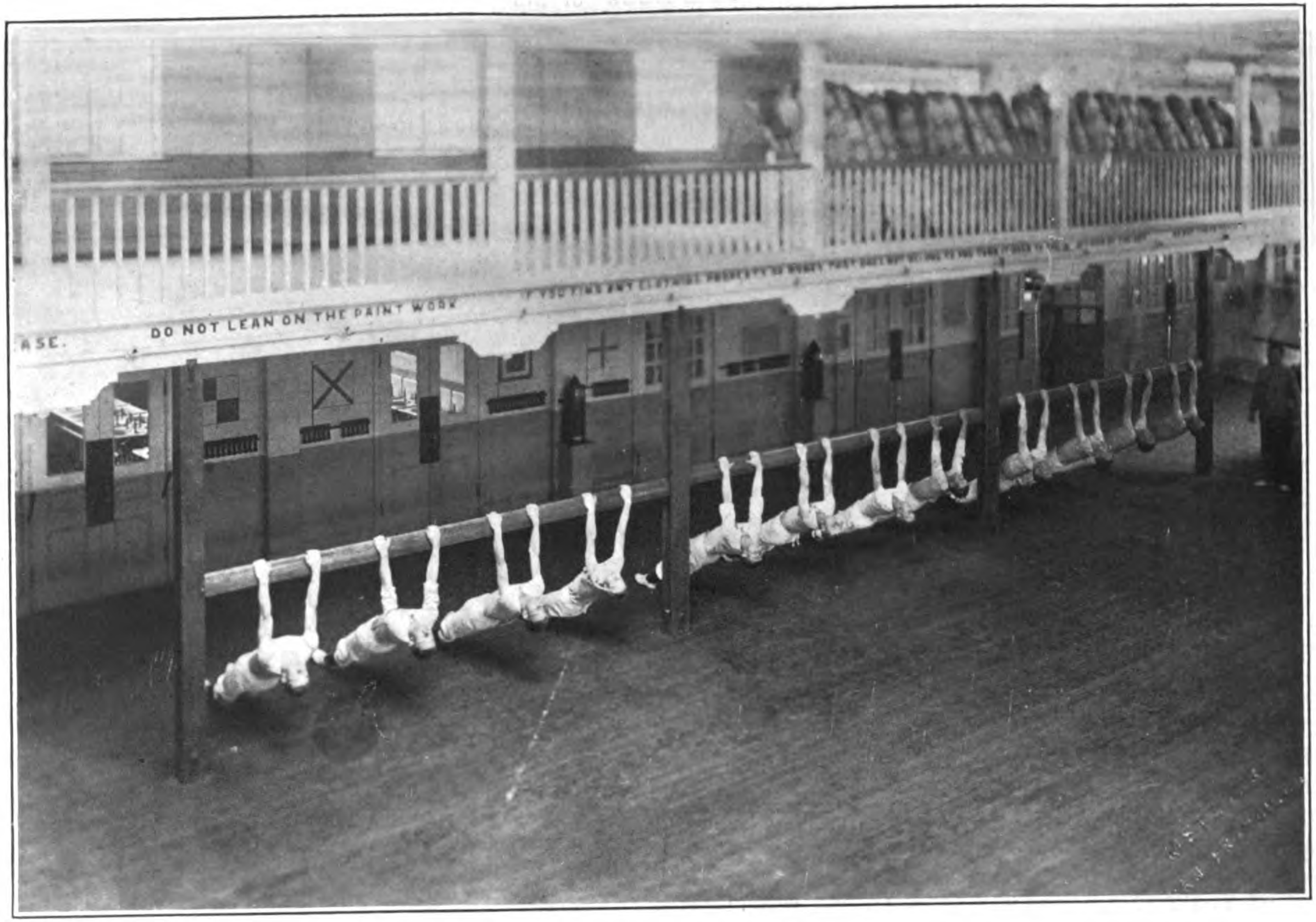

FIG. 11.—BOOM EXERCISE.

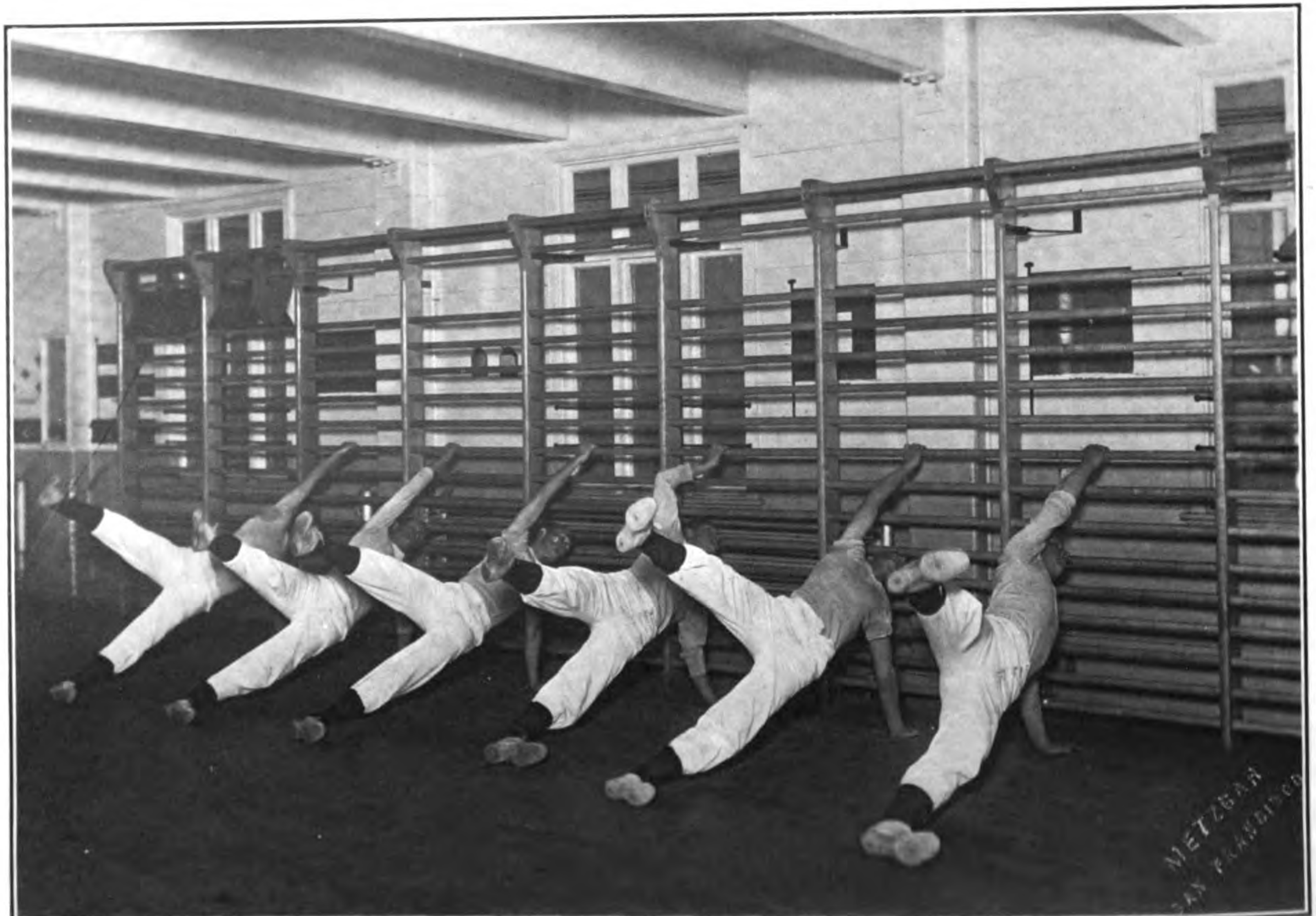

FIG 12 STALL BAR EXERCISE

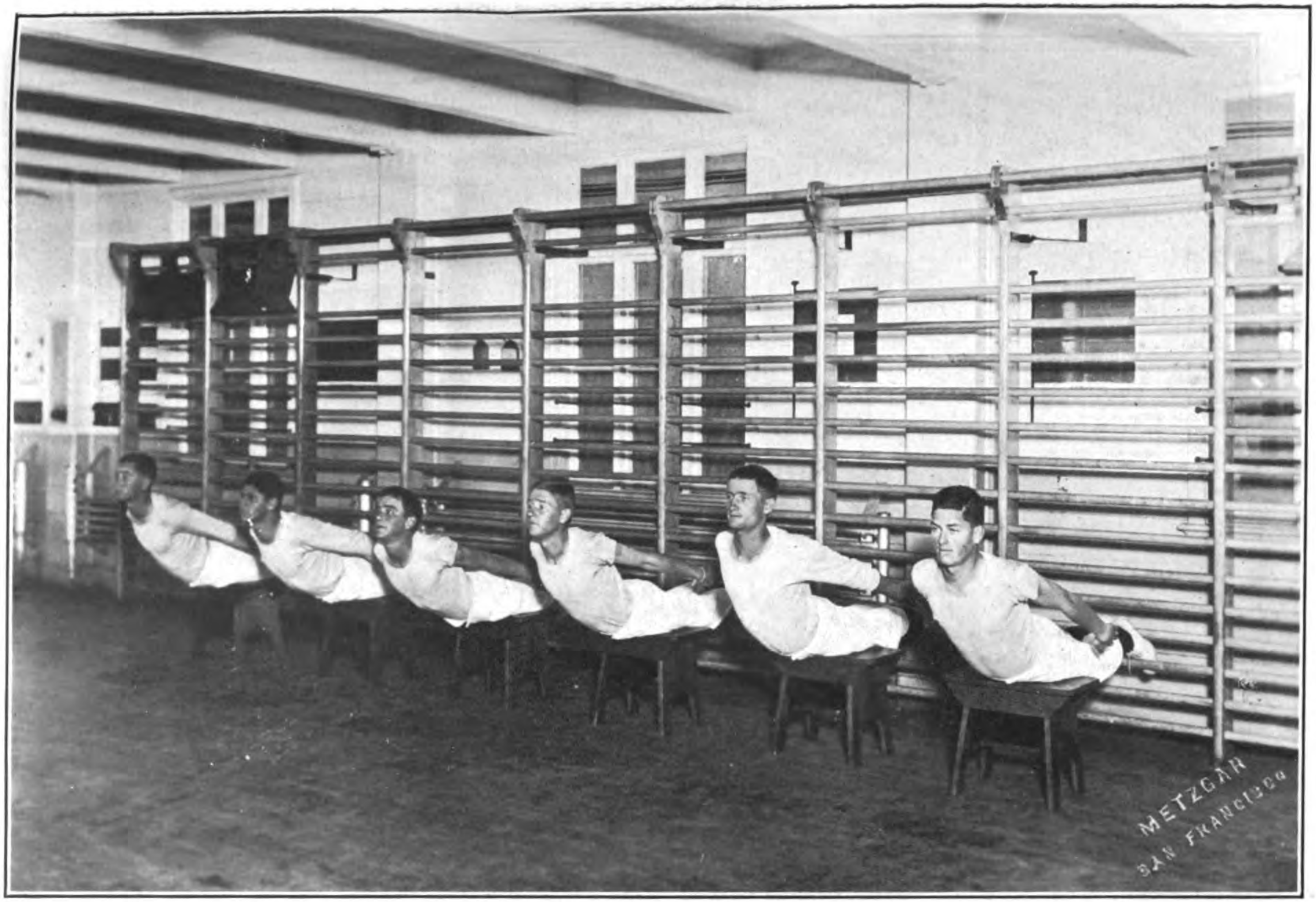

FIG. 13.—STALL BAR EXERCISE.

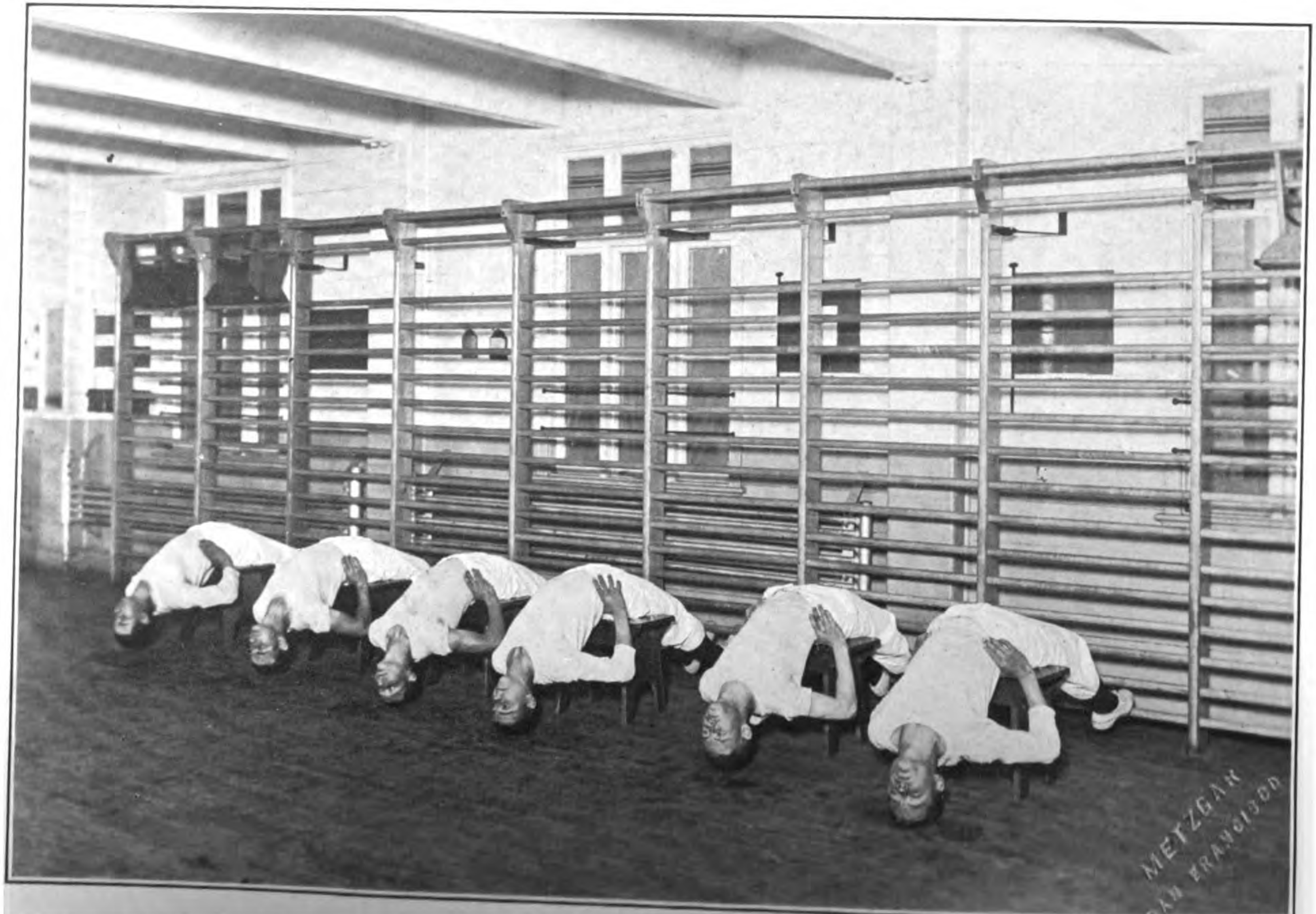

FIG. 14.—STALL BAR EXERCISE.

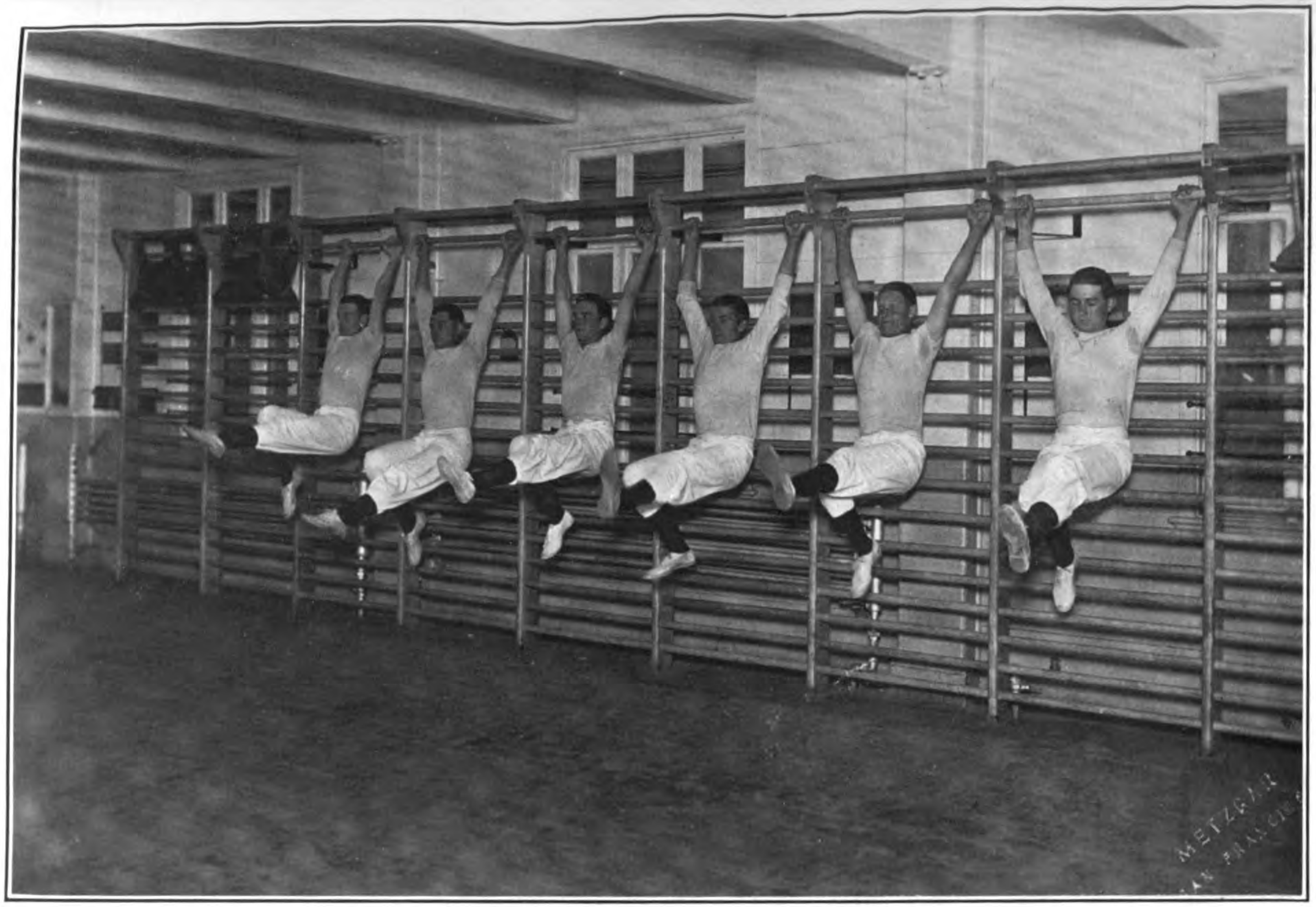

FIG. 15.—STALL BAR EXERCISE.

is avoided in order that a condition of stimulation will occur rather than exhaustion.

Exercise should produce the simple symptoms of physical activity, such as a general sense of warmth and well being, animation, sparkling eyes, cheerfulness, and mental exhilaration, instead of the opposite effect of overactivity, such as a vague sensation of discomfort about the heart, with constricting girdle sense, obscuration of vision, confused ideas, blunted sensation, and air hunger.

Progression and moderation are important features, therefore, as the effect desired is one of refreshment and rest instead of fatigue.

The word of command from the military standpoint is an important feature, the Swedish system of physical training proving on this account a desirable adjunct to the strictly military drills, affecting, as it does, the individual's all-around response to discipline as well as his physique. The constant introduction into consciousness of words of command, requiring attention, quick thought, and rapid muscular action, soon gives rise to a habit of obedience and quick response which greatly improves the military smartness and precision of the men. In the same period of time many more mental impressions and responses are possible than in the strictly military drills. These exercises, which through the system of application become pleasurable and exhilerating, work subconsciously in improving discipline and in creating a habit of attentiveness to the work in hand.

Form is insisted upon not so much from the show idea, but to correct faulty posture and to place the body in a designed starting position for work, with a view toward getting the physical effect desired. Certain fundamental starting positions are used, such as standing, sitting, kneeling, lying, and hanging.

Thousands of men and boys are examined for enlistment in the Army, Navy, and Marine Corps each year, and of this great number very few, relatively speaking, succeed in passing the physical requirements. The physical standard is not too high when the mental, nervous, and physical wear and tear that exist even in time of peace are considered. The individual's existence will not in time of war run along at freight-train speed, but rather at that of the fastest passenger train in comparison. A large percentage of the physical defectives appearing before recruiting officers would prove otherwise if physical training was carried out along proper lines as part of the education of the young. The results are poor because of lack of this training or of misdirected application of the idea. Many are satisfied that all is well, because the comparison standard is a common one, which, through familiarity, no longer seems unusually low. The tailor's art conceals a lot, and the freedom of choice of occupation in civil life covers physical weakness in many cases.

It is to be presumed that after careful selection the picked men enlisted for the service would stand out physically. This is not true from a muscular point of view, judging from observation covering several thousand of recently enlisted men. It is exceptional to find one who carries himself well or who is able to handle his body off the ground. The majority of boys and men are muscularly weak from the waist line up, the legs usually showing up well as regards strength. Others are strong, but through excess of weight (fat usually) prove relatively weak. Many of the strong are awkward, unresponsive, ponderous, and through stiffening of joints and contractures of muscles lack speed and agility. All of these types, with few exceptions, have rounded backs, protruding abdomens, drooping heads, and flat chests. Any attempt at effort lacks power, because orientation is disturbed and the normal straight line of thrust through the bones and joints is lost.

If called upon to advance upon an enemy's position, even though lightly equipped, of necessity in rushes, up a slope, through and over obstacles, with the effect of dread sapping physical vitality, what hope would this type of manhood give of arriving with sufficient wind and strength remaining to overcome in close combat a well-built, active individual of equal moral courage?

Observation shows that the former system of physical drills did not accomplish good results. Poor posture, already mentioned, was exaggerated, and while the men gained in weight and robustness, relatively speaking, a compensatory gain in strength did not occur. The men longest under training showed little or no improvement in ability to handle the body in situations where weight is a detriment rather than a help.

The old system consisted of a limited fixed set of exercises lacking variety and progression and performed either to music or by following the movements of a leader. After a short time, through familiarity, attention in this system becomes unnecessary, and the action soon becomes monotonous, indifferent, and spiritless. Form was only thought of from the exhibition standpoint and was considered from the point of view of rhythm rather than effect. Music drill or a follow-the-leader method is fatal to accentuation of attention and response, the action instead of being dreamy and negative. Instructors in direct charge of the men at training stations unanimously criticize music drill for any purpose, because they lose control of the men once the music starts, attempts at correction interfering with the rhythmic effect. The mind is put in a dreamy unreceptive state, so that the retention of memory study is interfered with. Much time that could be better spent otherwise must also be taken to teach the men the sense of rhythm.

The physical effect has been poor, because the average individual could not do the difficult exercises in form (particularly those with

the rifle) and keep up with the beat of the music. In consequence, having to keep moving or spoil the cadence, he shirks in every possible way, both in muscular thrust and by placing the body in faulty positions, to avoid the effect of weight and leverage, this last accentuating the already poor posture existing. Music drill is fascinating to the eye and ear of the spectator, but it will subordinate physical efficiency to show and display.

The dreamy effect on the mind of the performer will not advance him very far in acquiring the military attributes of alertness and obedience to command, qualities so necessary to developing unity of action in a body of men.

As applied at training stations the Swedish exercises aim to develop uniformly both flexor (bending) and extensor (stretching) muscles at the same time, so that a proper balance may be preserved between them, thus conserving the effort required in a planned action. The muscles are brought under the control of the will by the constant attentiveness necessary, due to the use of commands which are varied at will both as to intensity and rhythm. The variation permitted here can be used by a good instructor to hold the interest of the class, the commands and the response demanded placing a recreational element in the exercises.

Correctional exercises permit of a quickly produced marked change in the posture of the subject. A proper military carriage is a welcome change from the usual appearance of the majority of men. Everywhere are seen forward-drooping heads, rounded backs, flat chests, hollow backs at waist line, protruding abdomens (not fat), and pointed shoulders, provided padded clothing does not conceal these defects.

Primarily effort is concentrated on faulty posture, then on attentiveness, obedience and responsiveness to commands, then on all-around physical condition.

Constant play of will power on the part of those under drill is brought out by the inability to know what is coming next. Physical development becomes then a companion to increased mental quickness. As a result of the drill it has been very apparent that mental processes are exercised as well as the muscles, intellectual awakening having occurred, as manifested by greater ease in learning signals, for instance, and in brightening up the almost hopelessly stupid men who occasionally pass the recruiting officers.

The thinking and acting at the same time has the opposite effect to that already described as accompanying music or imitative drill.

The effect of nervous concentration on throwing the left leg forward on the order "march" is undoubtedly responsible for making the left thigh flexor muscles average stronger than the right. This muscle group is the only group in the body to average this way.

Nervous action can be counted on therefore to aid development, and there is no lack of it in the Swedish system.

Nervous control permits of instantaneous contraction of all the fibers of a muscle so that bulk with its disadvantages is not essential always to great strength.

The Swedish system favors nervous concentration on parts ordinarily rarely used, and by so doing aids in uniform development.

Numerous exercises of a balance nature provide for a better co-ordinating sense between the nervous and muscular systems. This team work, best appreciated when antagonistic muscles are in action, tends to easy and graceful action and conservance of endurance. Team work is also seen in exercises which train one limb to work with another so that complicated physical situations or movements requiring judgment both of time and place can be successfully met.

With mental and motor nervous action stimulated, muscular response becomes active and smooth, effort being applied economically.

Improved mental processes, nervous impulses, and coordinating muscular response are favored by the use of words of command given in irregular rhythm, and by the use of unusual and contrary movements.

Prompt decision, self control, and judgment are soon developed.

Constant changes in the character of the exercises and in the variations that can be given, produce a recreative feature without the loss of control and discipline. A feeling of pride, alertness, and fitness for any unusual physical situation is cultivated.

For mental and muscular quickness it is necessary to prevent draggy, monotonous, and slow action.

For this snap and life in action much depends on the instructor who should be young in physique if not in age, and be of active habit and athletic taste, and display in his own person interest, smartness and proper bearing and form. Lax commands and no insistence on proper response soon show bad effects in the action of the class.

Improved carriage of the body besides the constitutional effect derived from giving the heart and lungs more room and improving the support and function of the abdominal organs, places the body in a better position to do work by making lines of resistance pass along the bones, rather than off into space (sway back), and by rounding the chest gives the muscles attached to the thorax a better leverage.

Much of the physical unfitness as regards robustness and organic defects of the organs, seen in many applicants for enlistment, is due most probably to the effect of poor posture on the proper digestion and absorption of food and deficient oxidation from defective lung and heart action.

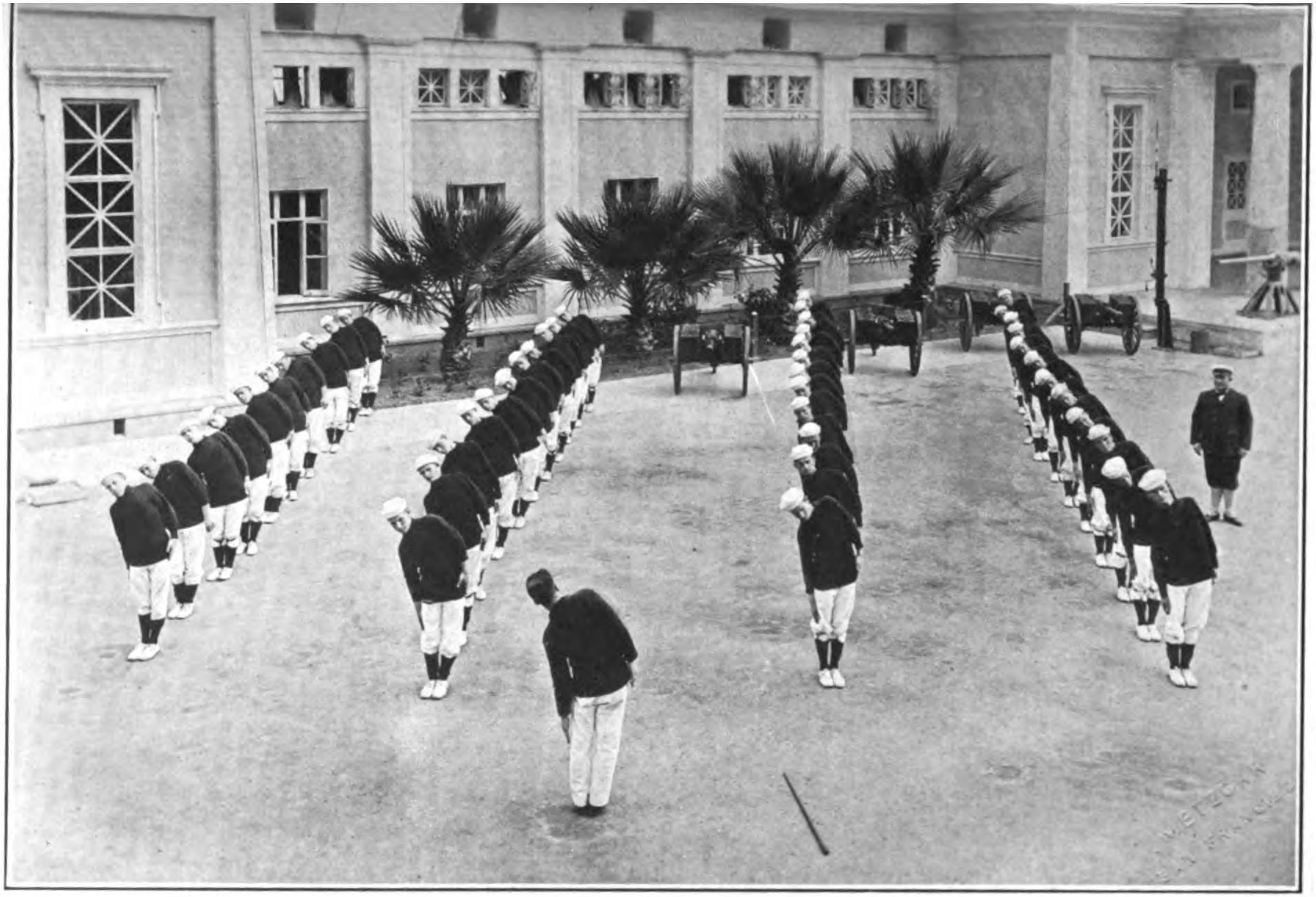

FIG. 16.—FREE STANDING EXERCISE.

FIG 17.

FIG. 18.

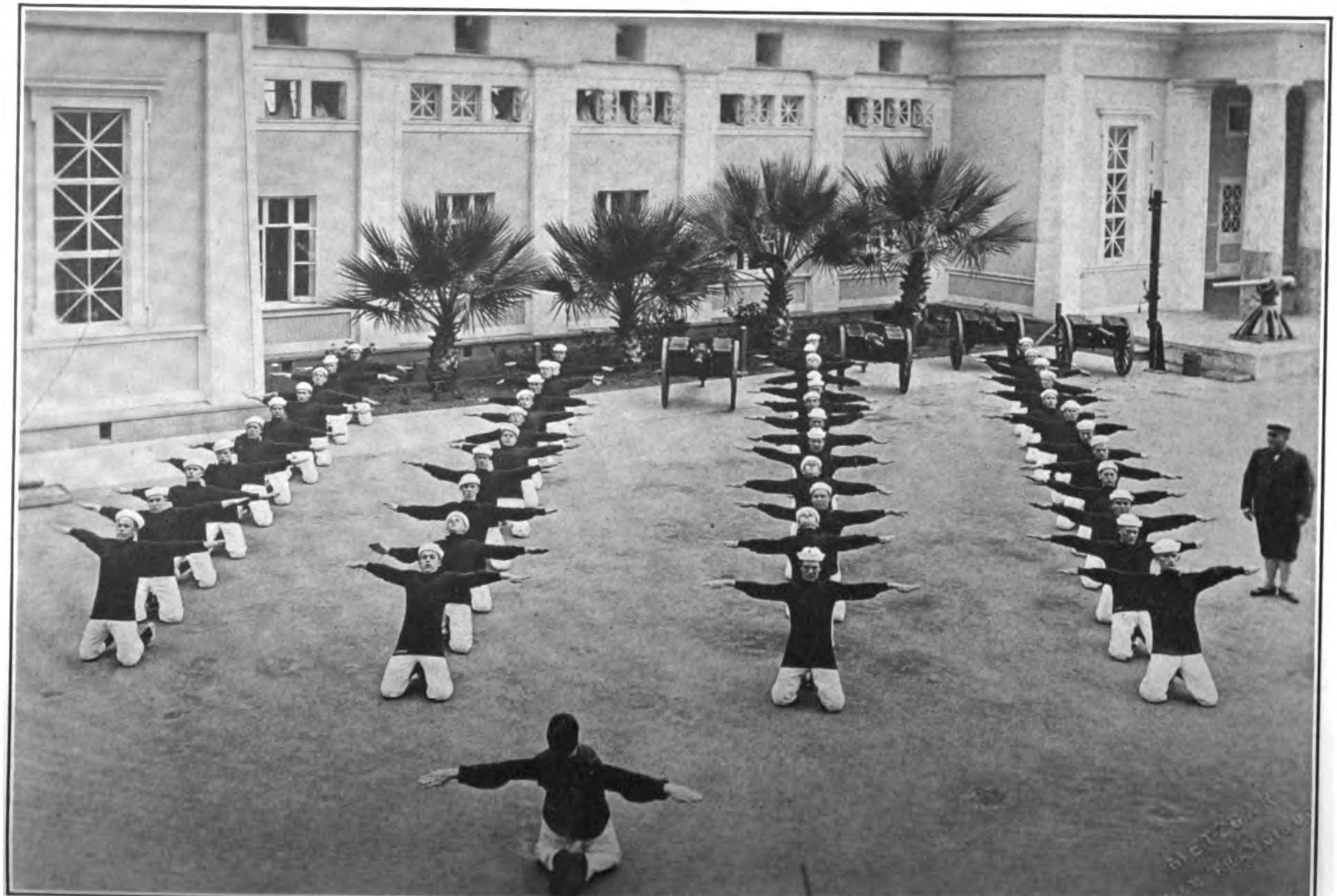

FIG. 19.

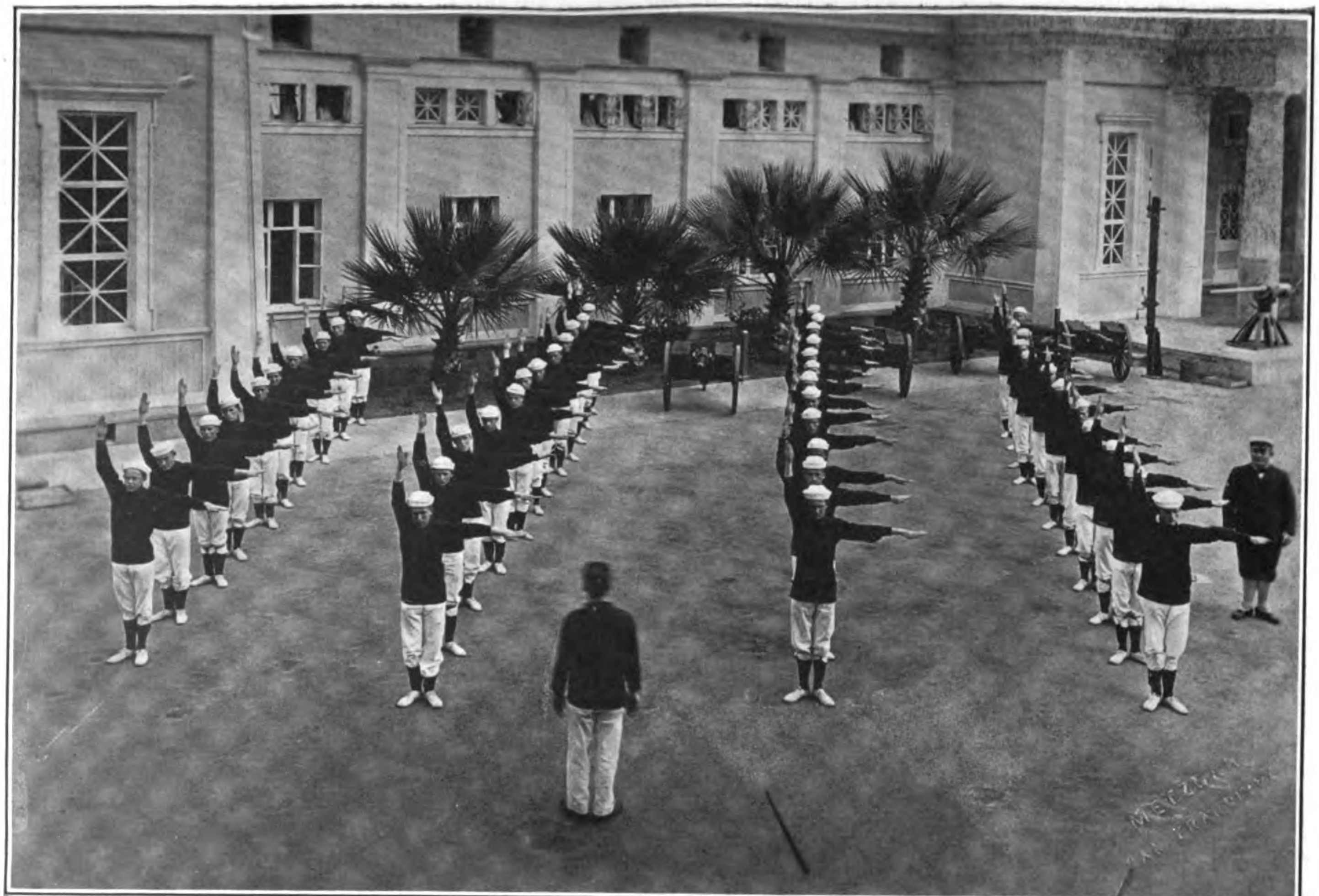

FIG. 20.

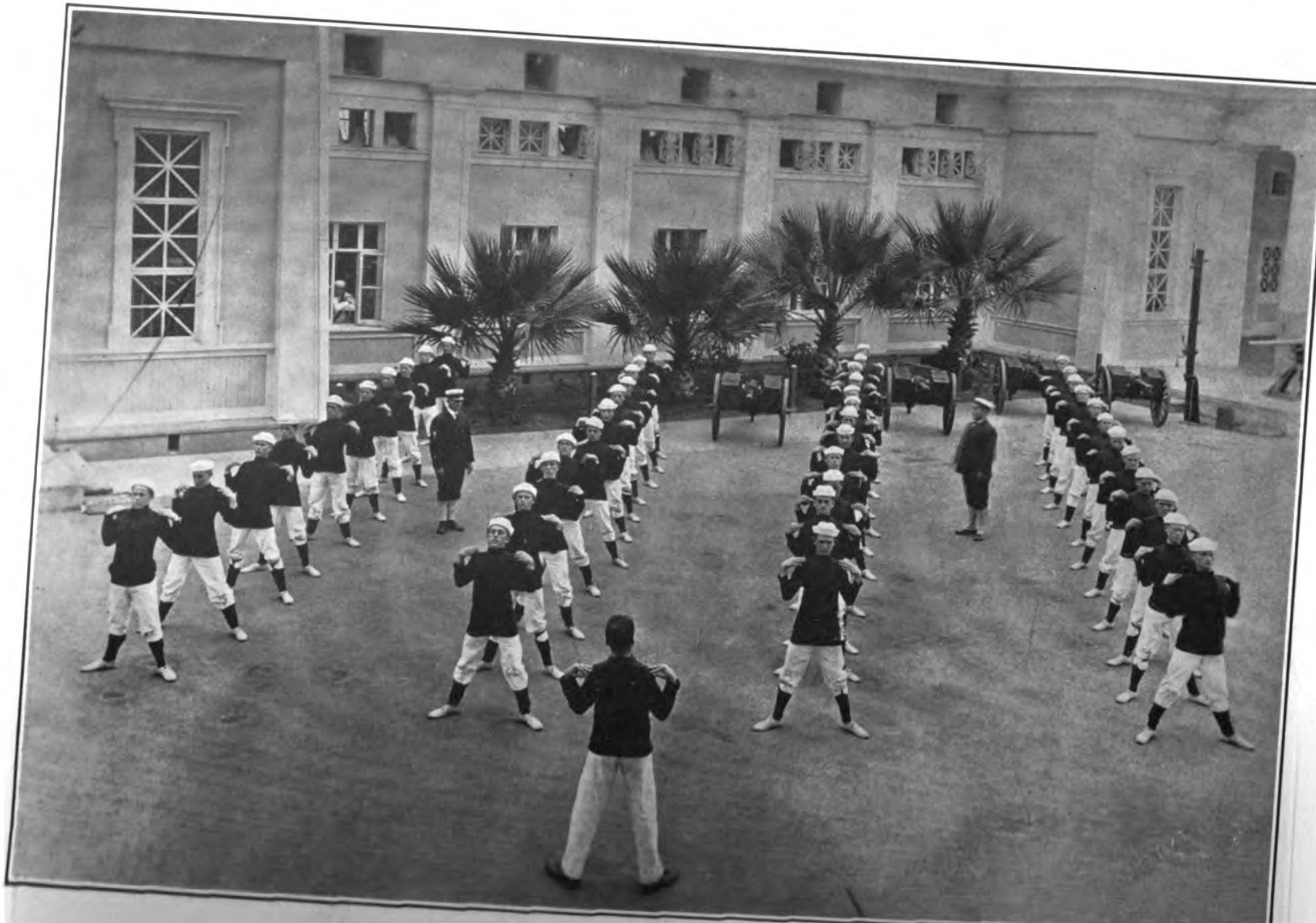

FIG. 21.

FIG. 22.

FIG. 23

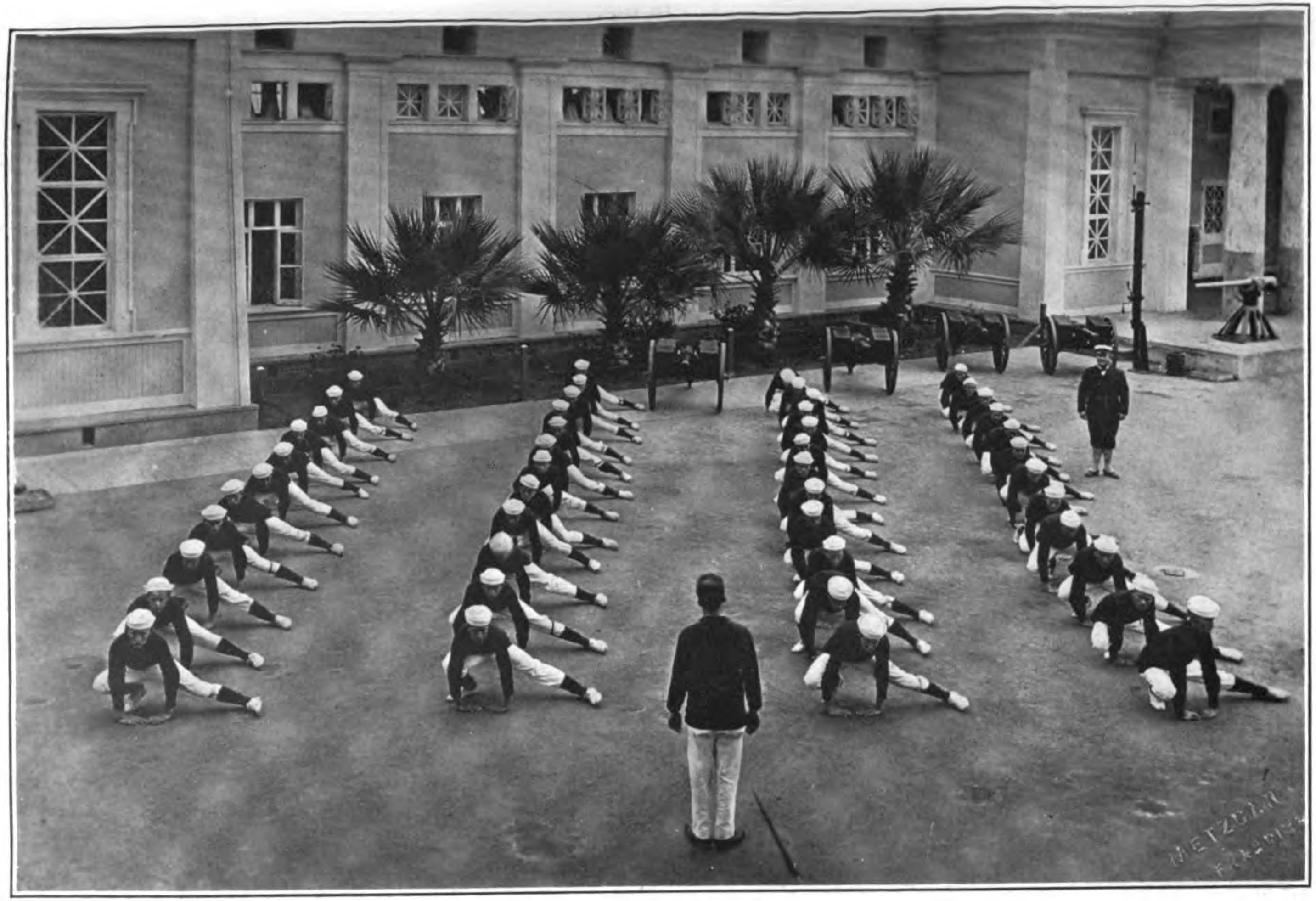

FIG. 24.

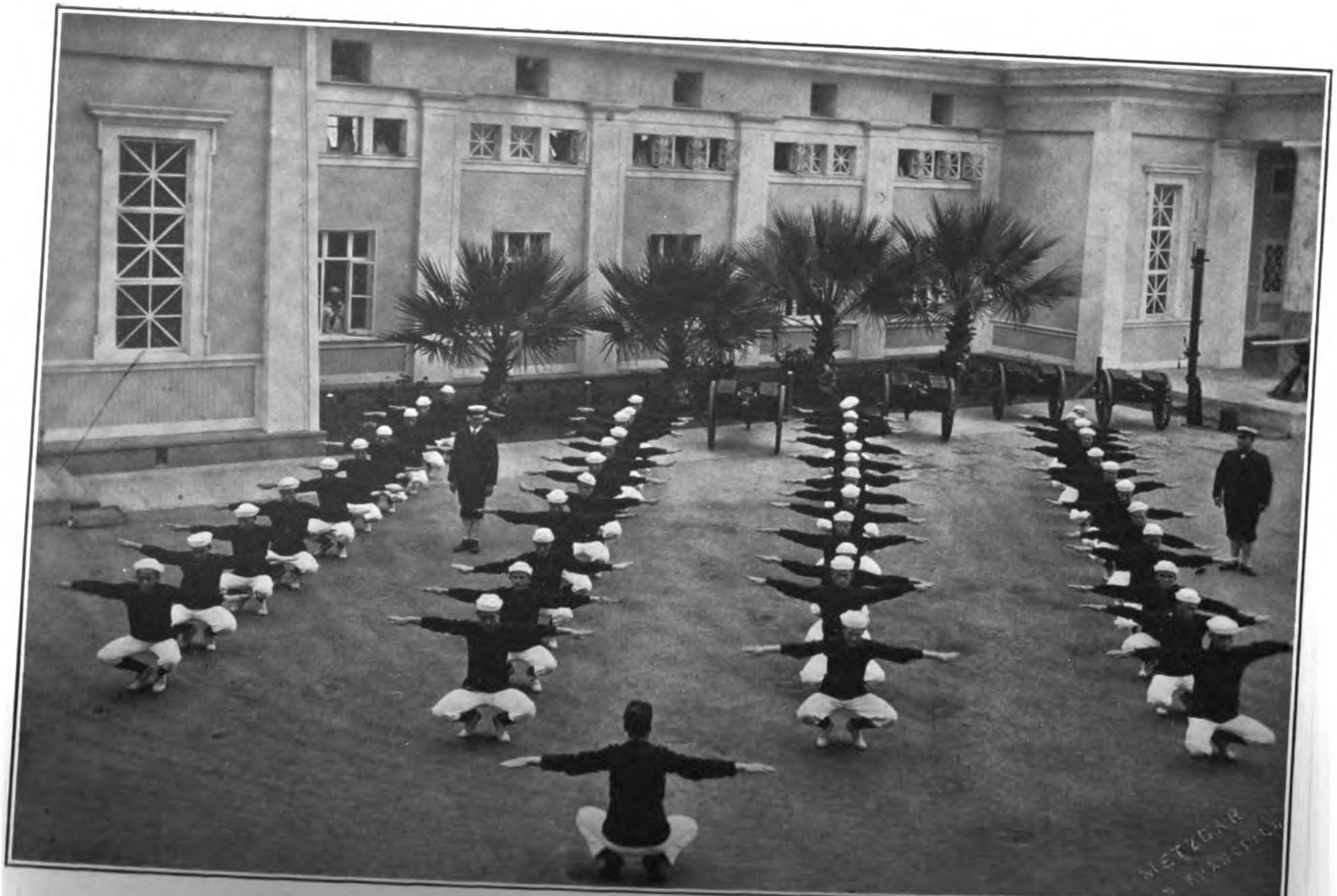

FIG. 25.

FIG. 26.

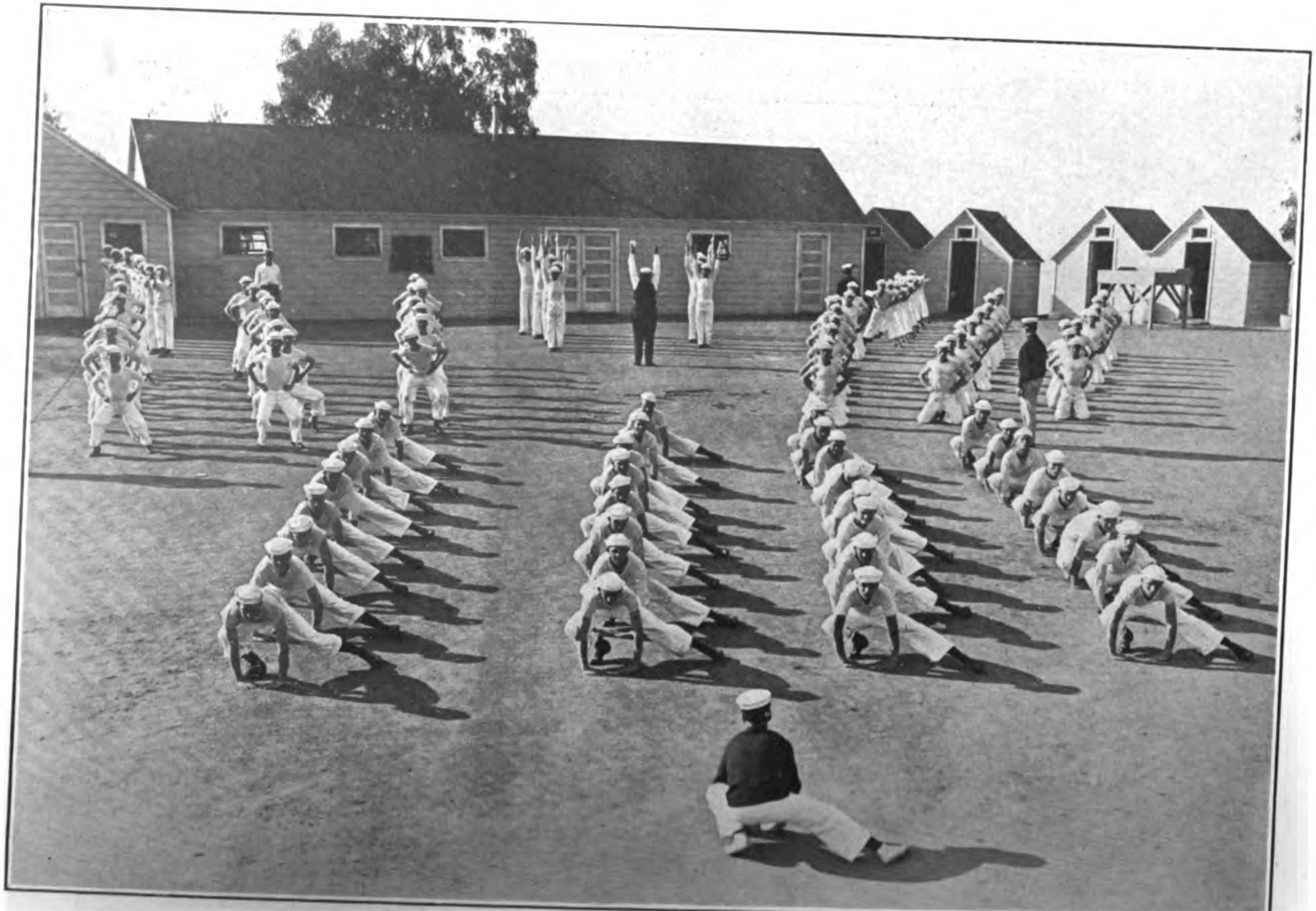

FIG. 27. FREE STANDING EXERCISE.
Various groups; some new men, some of 21 days' training

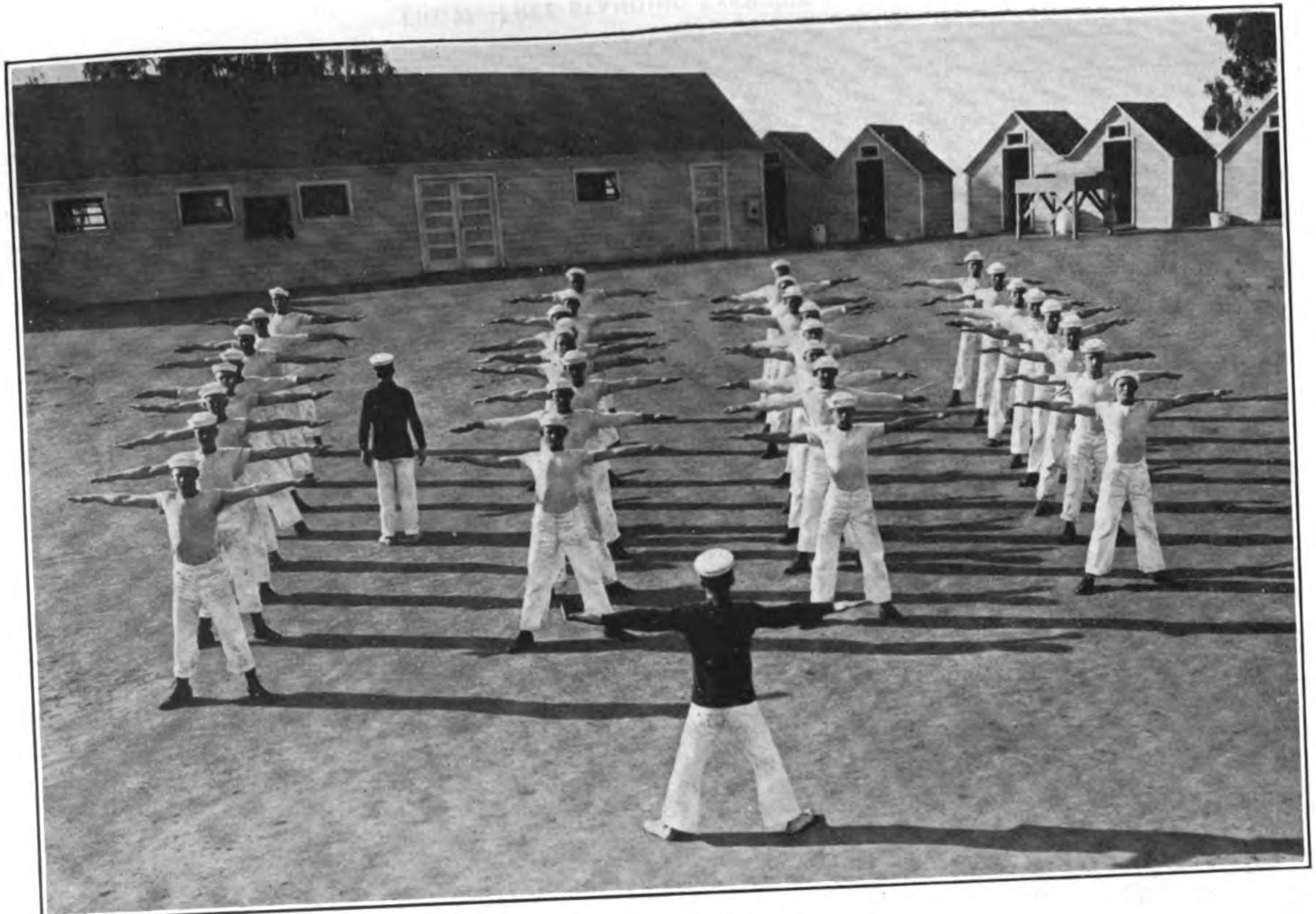

FIG. 28.—FREE STANDING EXERCISE.

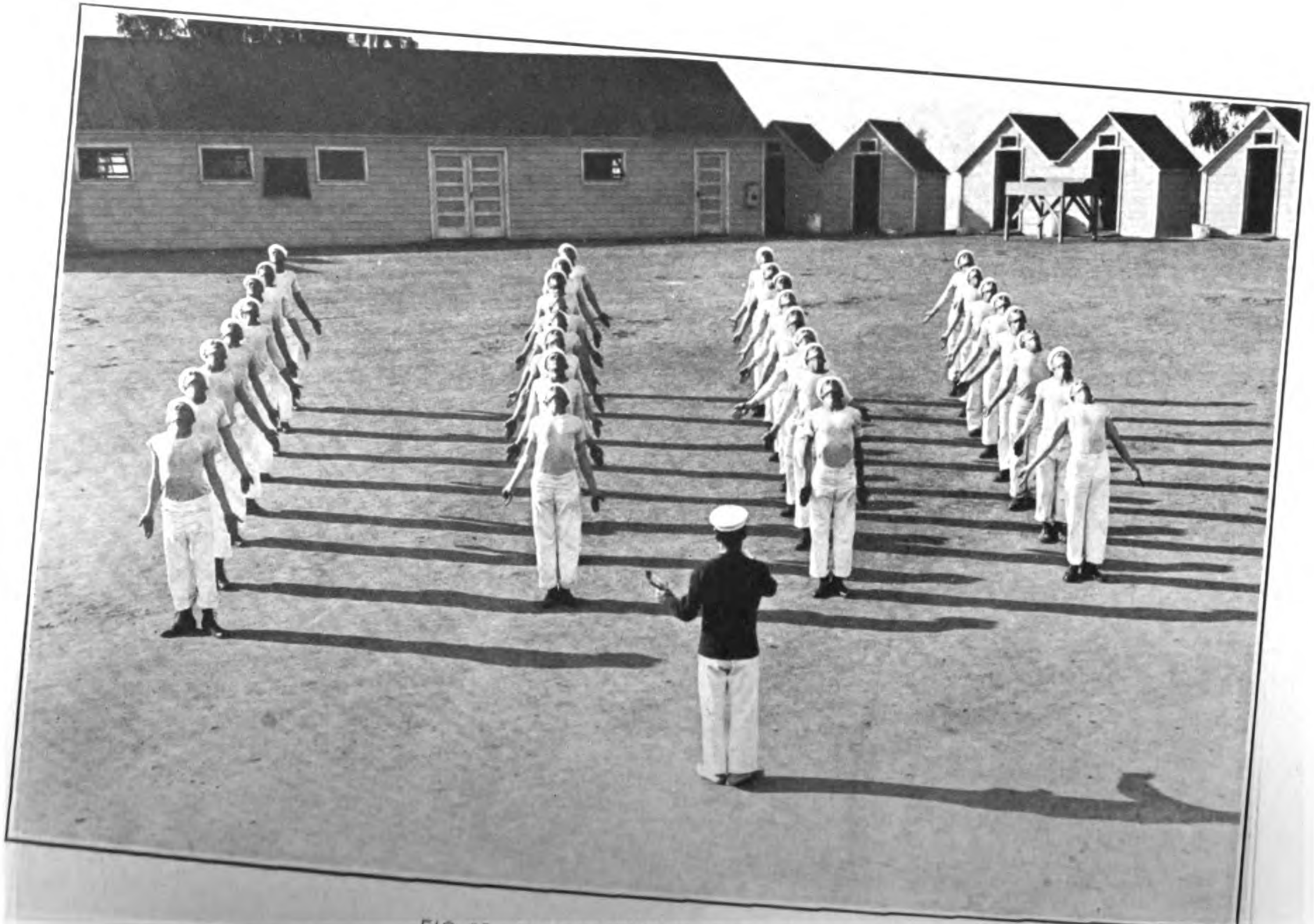

FIG. 29.—FREE STANDING EXERCISE.

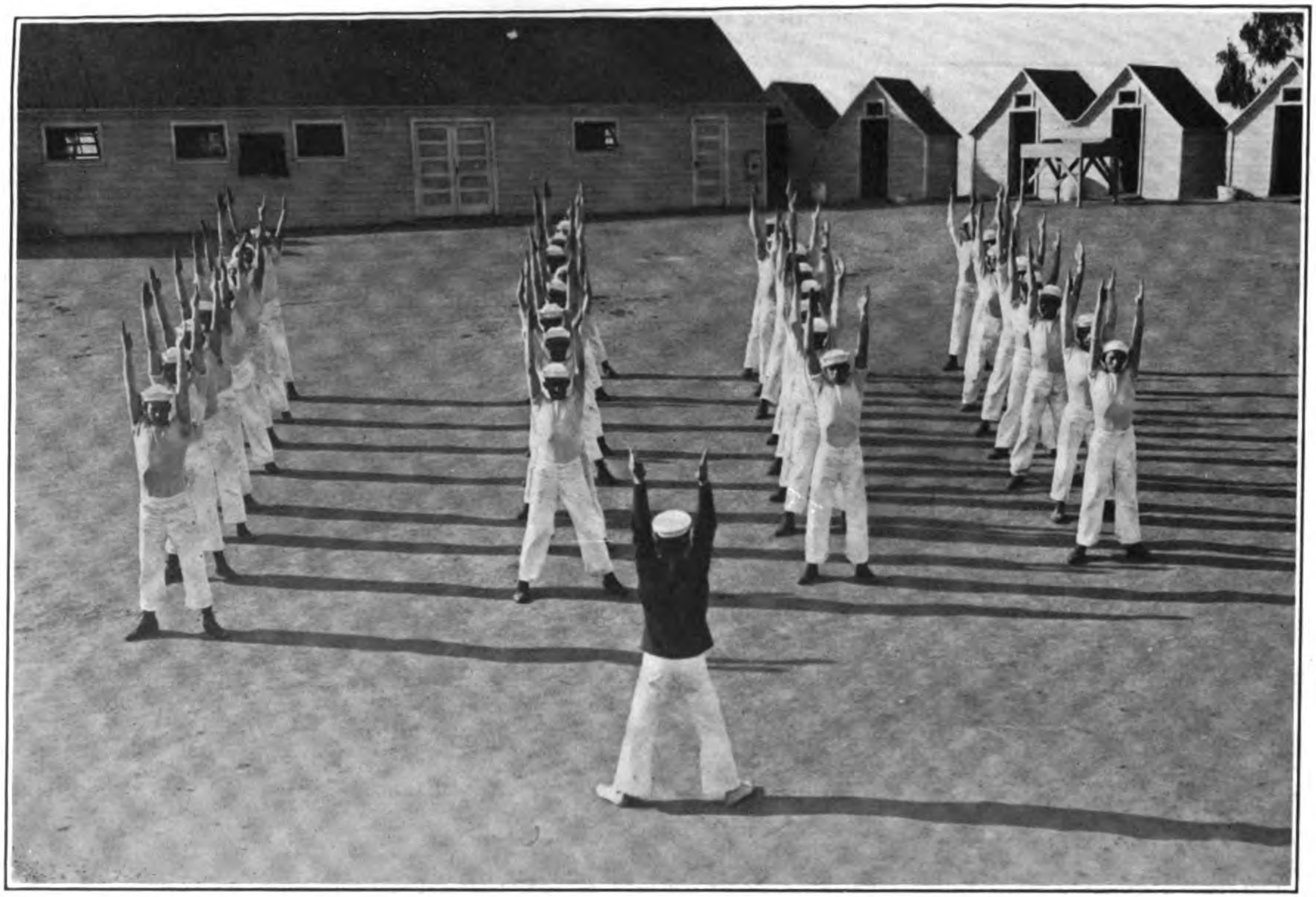

FIG. 30.—FREE STANDING EXERCISE.

Postural defects are sometimes due to over or one-sided development. Here, through lack of nervous control or to muscle contractures and lack of balance between antagonists, much energy or effect is wasted when attempts are made to accomplish work. It is common in swimming instruction, for instance, to meet well muscled individuals who, because their muscles refuse to function in proper team work with each other, in a surprisingly short time become exhausted.

Correction of postural defects about the thorax and spine is not limited alone to younger subjects. The exercises in use take only slightly longer to affect older men. Older subjects, even when physically strong, need physical training to prevent stiffening in joints, sluggish mental and muscular action, development of flabby or fatty flesh, and poor balance and decreased range in the motion of their muscles.

Poor form is an evidence of weakness somewhere or is due to contractured muscles and lack of play in joints.

Gracefulness and proportion as well as strength should be sought.

Such apparatus as is used, hand apparatus for additional weight, ropes, stall bars, booms, and shelf, is designed to provide a recreational effect that comes from exhilaration brought out by the necessity of overcoming something that presents some risk and difficulty. The various pieces of apparatus and the exercises performed thereon operate to fit the body to meet possible service conditions. The apparatus requires little space and would add but little weight aboard ship, and the cost is not great. The element of risk brings out the serious side of a man's nature so that his application to the work in hand is increased and a tendency to thoughtlessness or irresponsibility combated.

The primary object of the training should be to produce a military bearing and set-up, which, aside from the physical benefits already noted, cause an increase in *esprit de corps*, through personal pride developed and the reacting favorable impression on outsiders.

The secondary objects to be sought are increased attentiveness, responsiveness, obedience, and muscular power, all of which are very desirable qualities in a military body of men.

This training is essentially planned to develop the healthy and active efficiency of all and not of a specialized few. By doing this a decided gain is made in military efficiency, it being very apparent that the weaker units of a company of men slow the speed of the whole. This is of little moment when the opposing force also lacks speed and initiative. As mentioned before, the comparison standard may seem fast enough because a better standard has unconsciously been lost through slow retrogression.

The effects noted in the men and boys under training have been very marked along lines already touched on. These effects were especially pleasing in details like cooks, bandsmen, and coal passers, who, through occupation, mixed nationality, or mental dullness lacked cohesiveness and military characteristics. These individuals were unified into concerted effort, and slouchiness, laziness, and negativeness were quickly replaced by mental brightness, speed, aggressiveness, and smartness.

The mental impression of unfitness brought out by a sufficient number of easy exercises of effort which the mind realizes should be overcome without difficulty, but which the body is unequal to, shames the individual into taking an interest in developing and maintaining his physical state to a condition of fitness for whatever call may be made upon him in the line of his military duties.

Excess weight due to flabby, unnecessary fat is soon shown to be a burden and quickly disappears, much to the delight of the subject after a few weeks of training.

Compulsory drill is necessary to convince the average man that he is not physically prepared for the strains of the many diverse forms of effort likely to be brought out when push and drive become necessary to outmaneuver and overcome a well-conditioned worthy foe. Without compulsion the men most in need of exercise are very apt to postpone the breaking of ties which weld them to a sedentary easy-going, well-fed existence, or if they voluntarily take up some form of exercise, it is usually so mild as to increase rather than decrease their attachment to what becomes a comfortable, lazy habit. For such men there is some pain for a time in the creation of the healthy normal feeling that comes from good physical condition. In this state there is a longing for the feeling of well-being that goes with a proper dosage of exercise, and this will more than compensate for the former false state of apparent ease and contentment.

While modern naval warfare will usually obviate personal contact, yet there are many instances in recent years, in the Philippines, China, Samoa, Nicaragua, and Mexico, where the Navy personnel has performed military duties ashore.

Mental and physical strength are particularly necessary in preparation for personal combat and for overcoming the effects on the physique of possible duty on varying types of terrain ashore, it is also especially necessary even on shipboard in order to maintain a high standard of directing efficiency, from the higher ranks down, and to prepare the individual for the labor that goes with keeping the ship supplied with coal, provisions, and ammunition, and under way, and in working the guns under war conditions.

A strong physique will increase resistance to the ill effects of frequent changes in climate and also act as a steadying influence on

the nervous system as a check against panicky emotions that can be expected to appear as a result of the death and destruction in action that many men will experience for the first time.

SWIMMING.

Ability to keep afloat is of little final use if not accompanied by ability to move through the water to cover the necessity of making a distant object or to overcome a slight current.

Instructions should be limited to the simple breast, back, and side strokes. Later, racing strokes, fancy diving, etc., can be encouraged. Experience has proved that an individual with poor leg motion soon exhausts himself, owing to the drag of his legs and the fixation of his chest by the added effort required from his arms.

In fresh water a five-minute swim of slow progression will exhaust nearly all so-called swimmers using mostly an arm stroke.

A beginner should be taught right from the start to keep as much of his body in the water as possible.

Men able to swim for a short time with a poor stroke require considerable instruction to break their muscles away from habit. The land drill is especially beneficial in these cases. Men who are afraid of the water should be coaxed and not forced.

In teaching swimming a place with water not over shoulder depth should be selected. Thirty-foot instruction lanes give plenty of distance for proper observation by the instructor.

Dry land drills, based on the exercises used in the system of physical training, should be used to train the individual's muscle sense. By the use of commands any number of men can be controlled by one instructor. After a course of swimming exercises on land, one instructor should be able to take care of at least 20 men in the water, provided the space is limited. Land exercises also develop the muscles used in swimming. The procedure in teaching swimming should be as follows:

(*a*) Land drill, until the muscles respond smoothly.

(*b*) Water drill, either in shoal water where the men can place their hands on the bottom for support, or in a pool fitted with a surface rail.

(*c*) Free swimming, using floats of some kind. The best float for the purpose is made of a cork or white pine disk, 3 inches thick and 8 or 10 inches in diameter (top and bottom), joined to another disk by a canvas belt passing through a central slot in each disk, arranged for shortening or lengthening. The ordinary life belt gives too much flotation and is in the way.

(*d*) Free swimming: The leg movement is the same for the back and breast strokes. At first it is taught in five counts so as to teach

the flip of the foot, the proper use of which prevents dragging and improves the thrust. The pupil takes support with one hand (see photograph). At " one " the outer leg is drawn upward, knee turned outward (sideways), and the sole of the foot, the toe pointed downward, turned toward and close to the other knee. At " two " the toes (foot) are brought up toward the shin. At " three " the leg is stretched sideways and downward. At " four " the foot is pointed. At " five " the leg well stretched is brought against the other leg.

The arm movement starts from the overhead (or forward) position and is brought to the horizontal side position at " one." At " two " the elbow is brought against the ribs and the hand to the nipple. At " three " it is thrust to the first position. At " four " there is no movement.

The leg movement, in four counts, is similar to the five-count movement, except that the foot motion is combined with the thrust and the squeeze. At " one " there is no movement. At " two " the knee is brought up. At " three " the foot is bent toward the shin and the leg then quickly thrust sideways and downward. At " four " the foot is pointed and the leg brought quickly with a snap against the other leg.

Combined arm and leg swimming: At " one " the movement of the arm takes place as above. At " two " the second count of the arm is done simultaneously with the drawing up of the knee. At " three " the arm is thrust to the first position, as the foot is drawn up and the leg thrust sideways and downward. At " four " the leg is brought to the other as above (no movement of the arm).

Both legs can be used (breast or back stroke) while in the lying, hanging, or forward lying positions. The arms can be combined with the legs in the lying and forward lying positions.

In the breast stroke it is necessary to have the proper rhythm between the arm and leg movements. There is no movement of the legs on the first movement (count) of the arms. There is no movement of the arms on the fourth movement (count) of the legs. At first there should be a distinct pause at the end of each movement in order to accentuate the position. Later the movement should be continuous from the starting to the finishing position. The first and second motions of the arms and the first movement of the legs should be done very slowly. At the end of each stroke rest momentarily for relaxation of the muscles and to allow the body to make distance through the water without effort.

The arm movement in the back stroke ranges from the hips to the horizontal position out from the shoulders, the forearm being extended at the end of the motion. The arm, fully extended, is then brought back to the side. The arms and legs work together in this stroke (three counts only).

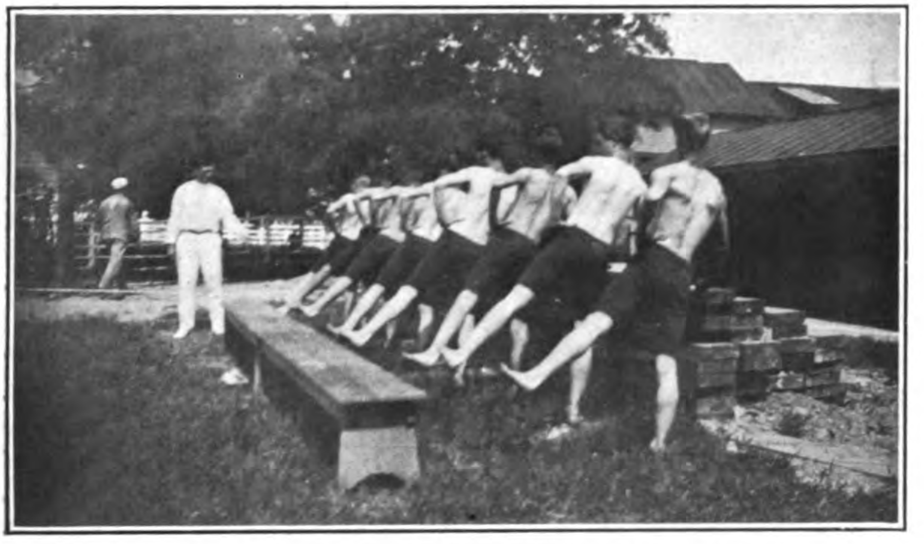

FIG. 31.—LAND DRILL IN SWIMMING EXERCISE.

Leg exercise in the standing position

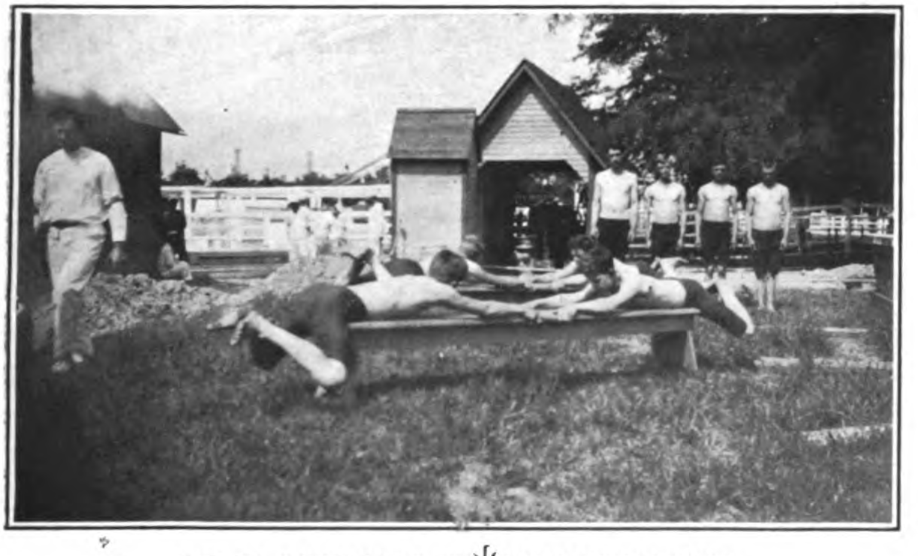

FIG. 32.—LAND DRILL IN SWIMMING EXERCISE.

Leg exercise in the lying position.

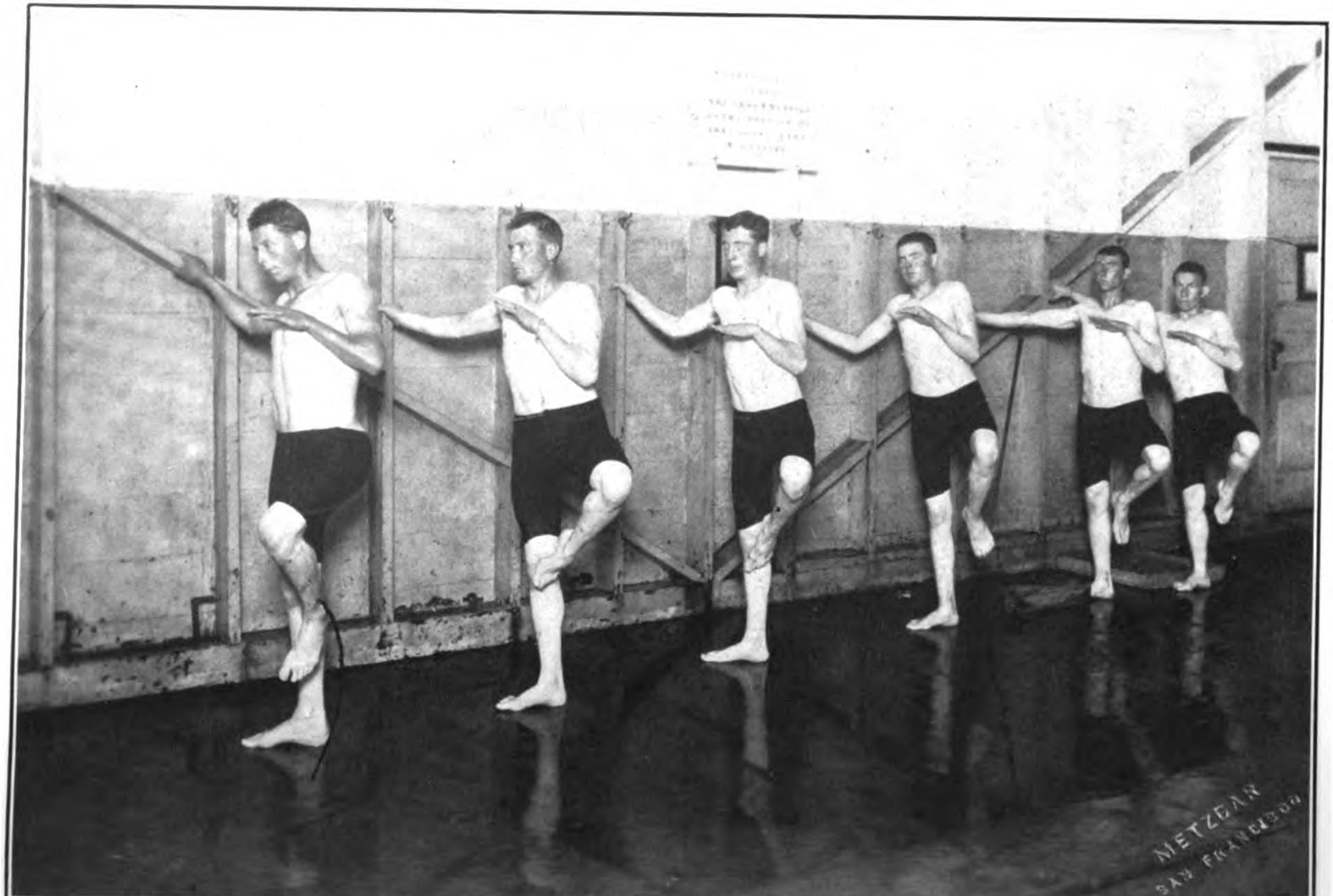

FIG 33. LAND DRILL IN SWIMMING EXERCISE.
Standing position for breast stroke; second movement of arm, first position of leg

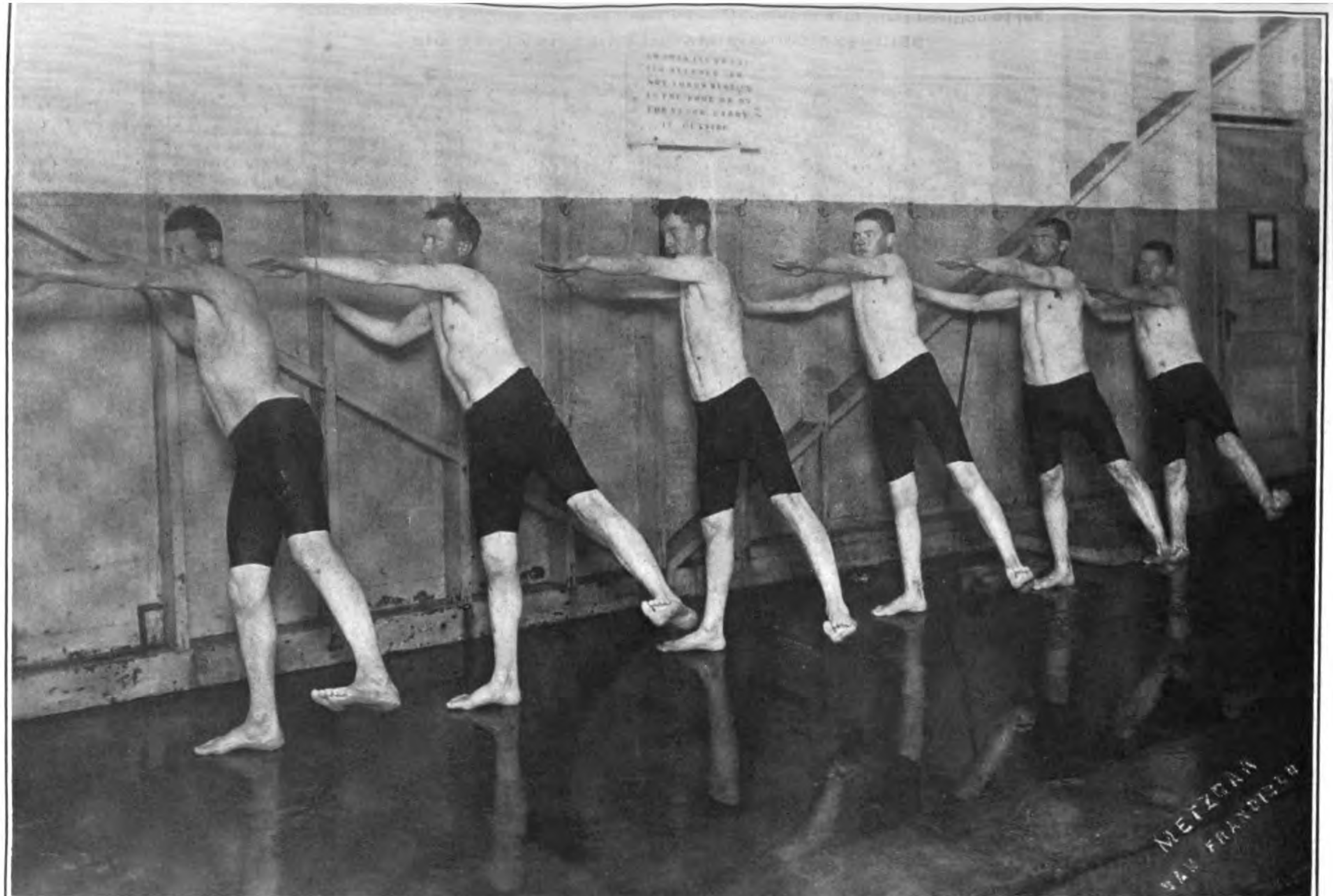

FIG. 34.—LAND DRILL IN SWIMMING EXERCISE.
Third movement of arm; second movement of leg.

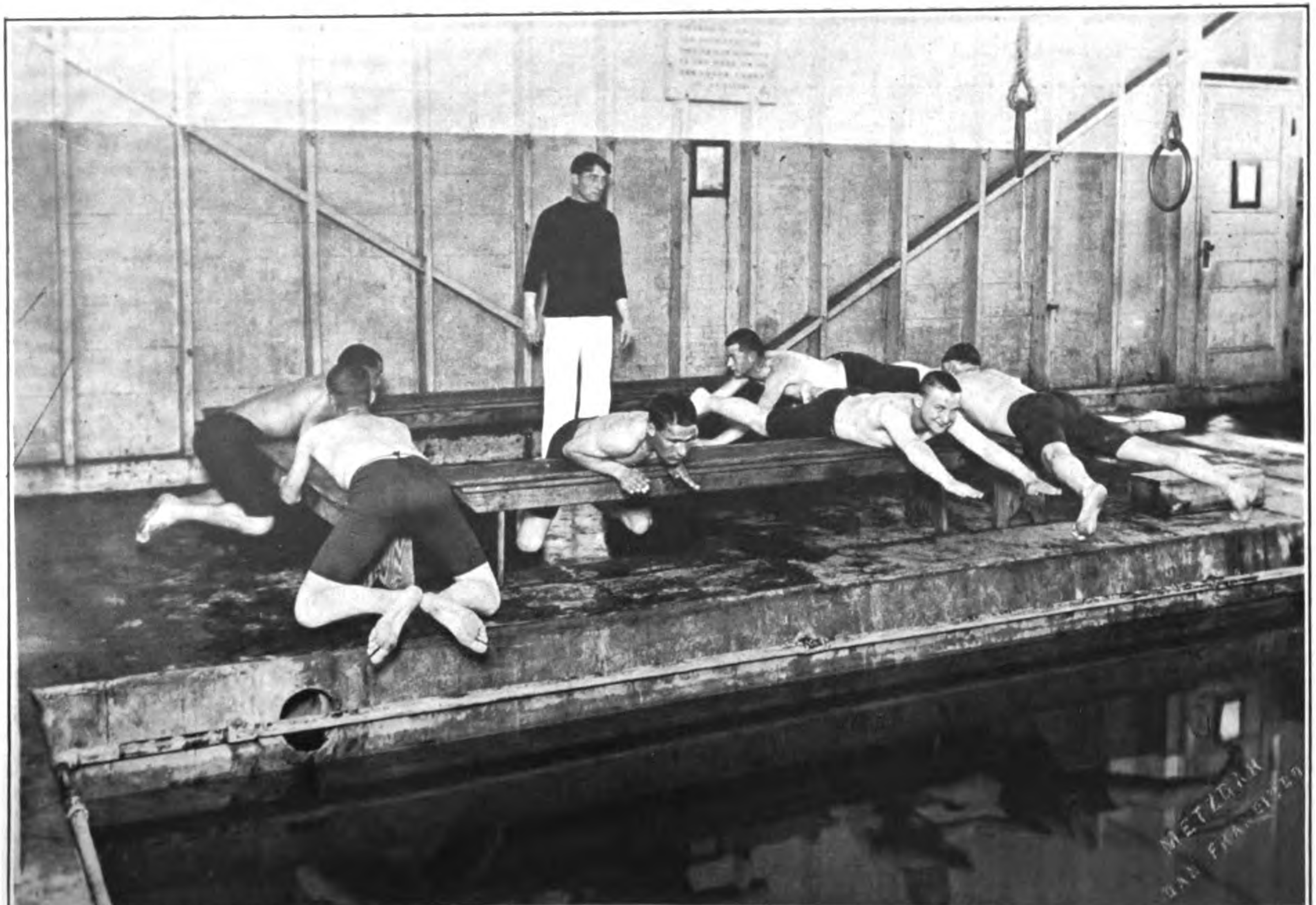

FIG. 35. LAND DRILL IN SWIMMING EXERCISE.

On the left: Leg movement alone. On the right: Arm and leg movement combined.

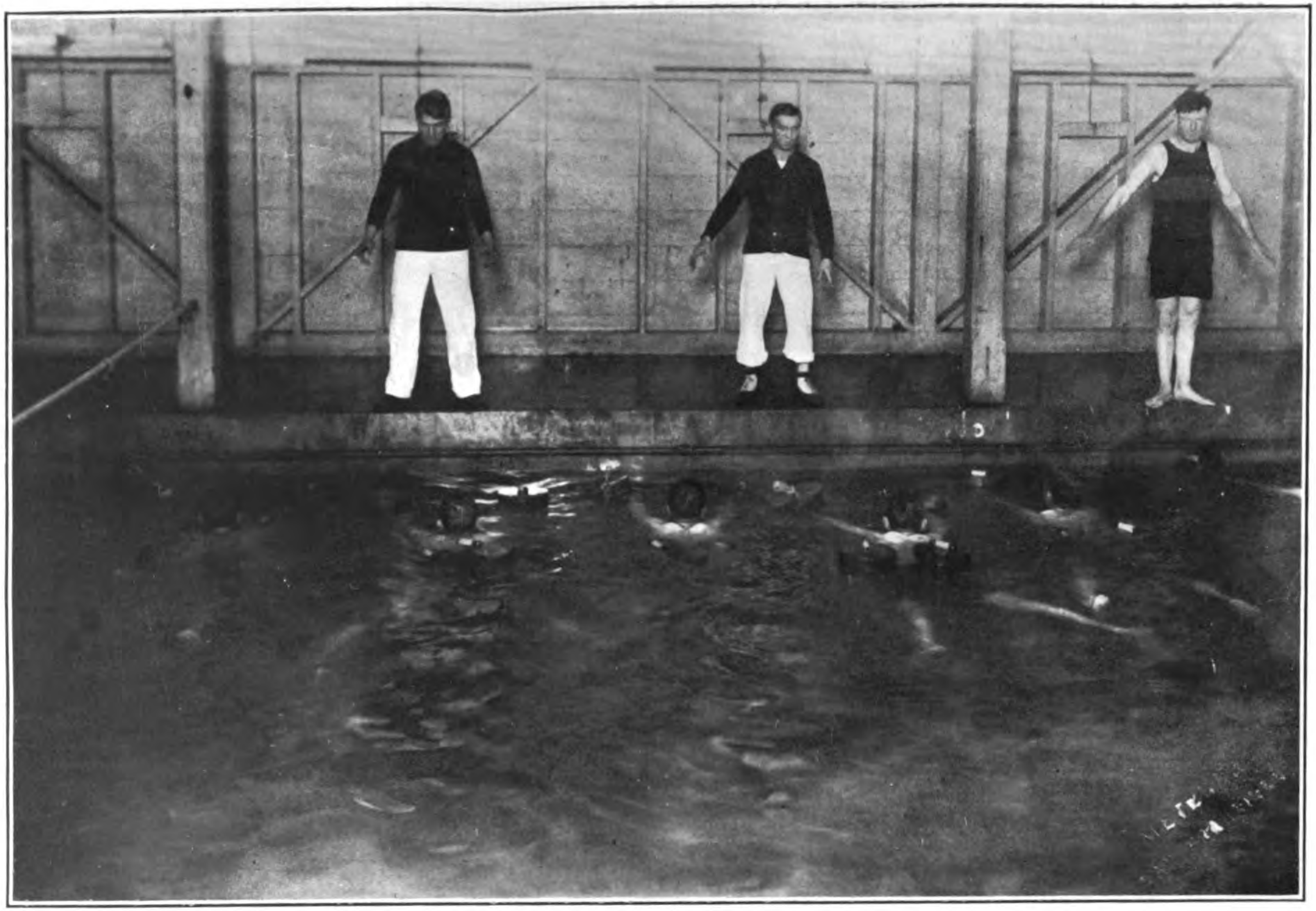

FIG. 36.—SWIMMING MOVEMENTS IN THE WATER.
Leg movement only.

The leg movement in the side stroke, lying on the left or right side, or hanging. At "one" both knees are drawn upward to a right angle to the spine, the lower legs being bent at the same time so that the heels nearly reach the back part of the thigh. On "two," without lowering the knees, the legs are stretched, at the same time thrusting downward, the right (left) forward, the left (right) backward, so that a "V" is formed. The leg nearest the surface is always stretched forward. At "three" the legs, fully stretched, are brought together, without crossing, like a pair of scissors.

The arm motion in the side stroke is peculiar. If swimming on the left (right) side, the left (right) arm ranges from the overhead (stretch) position downward toward the bottom, then by a bending at the elbow it is brought to the side of the breast nearest the bottom and shot upward (forward) to the starting position. The right (left) arm moves from a bent position against the chest to a straight position at right angles to the spine level with the shoulder (reach), and then sweeps just under the surface toward the right (left) hip, where it is bent and brought to the starting position (the palm close to the abdomen and chest). As the knees are drawn up the arm nearest the bottom makes its sweep to counteract the drag. The arm nearest the surface follows the direction of movement of the upper leg all through its cycle.

COMMON FAULTS IN THE THREE STROKES.

Breast stroke:

(*a*) Legs and arms moving together (improper rhythm).

(*b*) Drawing the knees up too fast and beyond a right angle to the spine.

(*c*) Not separating the knees, with the heels close together.

(*d*) Drawing the lower leg up, followed by the upper leg, thus causing a double drag against the water.

(*e*) Not keeping the arms moving just under the water, avoiding a dog-paddle effect.

Back stroke:

(*a*) When drawing the knees up, meeting them with a bend in the spine, causing the back to round instead of remaining straight.

(*b*) Not keeping the arms moving just under the surface. A circling movement tends to pull the body under.

(*c*) Head not back in the water so that the ears are covered.

Side stroke:

(*a*) Separating the knees, which tends to turn the body toward the breast-stroke position, causing wasted effort without accomplishing distance.

Side stroke—Continued.

(*b*) Carrying the upper arm ahead of the shoulder or across the hip.

(*c*) Crossing the legs at the end of the stroke.

(*d*) Starting to bend the knees for a new stroke before the stroke is completed.

(*e*) Side of head not kept in the water.

All strokes:

(*a*) Except in racing, all parts of the body should be kept in the water, including as much of the head as will not interfere with breathing. This relieves the swimmer from expending effort for flotation and permits him to expend it all for propulsion.

(*b*) Propulsion should be parallel to the surface. Many beginners through misuse of the arms and lack of proper thrust with the legs swim at an angle with the surface. This produces a bobbing effect, the weight of the head and shoulders sinking the body under between each stroke and requiring the individual to waste effort to bring it clear again.

(*c*) The fingers should be held together.

At first about one-half the period should be devoted to land exercises, one-quarter to exercises in the water (on the rail), and one-quarter to practice in the water on the floats. The men should be prevented from too early discarding the floats until such time as they can move through the water without reverting to faulty use of the limbs. The pupil should return frequently to the rail to practice the leg motion. Those men who have acquired full knowledge of the proper movement for each stroke and whose muscles have responded sufficiently to the drill should be permitted to practice the full period in the water.

It frequently happens that the side or back stroke will come easier for some individuals than the breast stroke, which should be used first as a basis for results. If this tendency is noted attention should be concentrated on the motion most nearly in form. When one stroke is acquired confidence is increased to such a degree that the other strokes soon follow.

During the time assigned to free swimming (with or without floats) the instructor should not concentrate his attention on one man, but be prepared to caution all as to departure from form and to the common faults. In addition to the faults mentioned, the pupils are apt to move their limbs too fast, thus soon causing exhaustion, or to reverse the speed of the leg motion by drawing the knees up quickly and slowing down the scissor part of the movement.

A STUDY OF THE ETIOLOGY OF GANGOSA IN GUAM.

Based upon luetin reactions and Noguchi tests on 369 gangosas and 16 controls.

By C. P. Kindleberger, surgeon, United States Navy.

Gangosa is a disease of unknown origin which has existed in Guam for over 100 years. It was first described, in 1828, by Don Francisco Ruiz de Villalobos, commisioner to the Marianas Islands, and a captain in the Royal Spanish Artillery. For the disease as we now know it, "gangosa" is certainly a misnomer; "rhinopharyngitis mutilans," the anatomical and descriptive name given it by Surg. J. F. Leys, United States Navy, in 1904, is certainly more scientific and generally preferable.

Leys studied gangosa while on duty in Guam and wrote the following description:

"Lesions similar to those which characterize this disease and not to be accounted for by any connection with syphilis, tuberculosis, or leprosy, were mentioned in 1839 by Maxwell, who encountered them in Jamaica and believed them to be sequelæ of frambesia (yaws). Following Maxwell in this belief, Numa Rot described 60 cases which he encountered in a limited district on the windward side of the island of Dominica, West Indies, as probably representing some last stage or sequela of yaws. C. W. Daniels, who encountered cases in Fiji, was the first writer to throw doubt upon their connection with yaws. Many observers who have no familiarity with the condition and who have seen it only casually have confounded it with leprosy, tertiary syphilis, or localized tuberculosis. It was differentiated from these diseases and from yaws and described as a disease *sui generis* under the name "rhinopharyngitis mutilans" by the present writer, first in 1904 and again more fully in 1906. Since its specific cause is still undetermined, and since any of the gross lesions characteristic of rhinopharyngitis mutilans may be produced by some other disease, its differentiation may be said to rest at present almost entirely upon its peculiar and extensive prevalence in certain places—certain known endemic areas. The only regions of the world that are known at present to be endemic areas for this disease are Fiji, Guam, the Caroline Islands, and the island of Dominica, West Indies. A study of the condition at first hand in any one of these endemic regions will soon convince the most sceptical observer that he is dealing with a peculiar pathological condition, which, whatever it may be, is certainly not syphilis, nor tuberculosis, nor leprosy.

"Rhinopharyngitis mutilans is a peculiar destructive ulceration of the nasopharynx, prevalent in certain limited areas in the Tropics, without constitutional sypmtoms and usually running a self-limited course, with a tendency to cicatrization. It is almost certainly in-

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fectious and quite probably contagious. Its specific cause has not been discovered. The patient, if seen early, as few are, complains of sore throat. On examination an ulcer is seen on the back of the pharynx, on a faucial pillar or on the free edge of the soft palate. It is superficial, movable, covered with a thin, dirty, greenish-gray or brownish-gray pellicle of slough. This is apparently the initial lesion. The pellicle breaks down and leaves an ulcer, which steadily increases, advancing up the throat into the posterior nares. The disease begins in the soft parts, but, after reaching the soft palate and eating its way through the entire thickness, attacks the bones of the palate and nasal septum, finally destroying them. The serpiginous ulceration, after being thus active and advancing for months or years, usually arrests itself at this stage, the ulcers healing, and leaves the victim with no septum, the nasal cartilage and skin fallen in, the nose and mouth one large cavity. The faucial opening is apt to be narrowed by cicatricial tissue, making deglutition difficult. The disease rarely advances downward from the pharynx, the larynx is only exceptionally affected, and phonation remains normal, though, owing to palatal destruction, the quality of the voice is deranged, the speech being affected precisely as in any case of cleft palate. There are no constitutional symptoms. The patients, if they were so in the first place, remain well fleshed, strong, and able to follow their usual avocations. The disease process having ceased, the patient carries its marks in palatal bone destruction and pharyngeal scar tissue to old age. In a few of the cases, fewer than 10 per cent of them, the process is not arrested at this stage, and the ulceration destroys the cartilage and skin of the nose and advances upon the face. In about 25 per cent of the cases (21 out of the 81 cases in Mink and McLean's series), the process extends through the nasal ducts into the conjunctiva, where it produces in the eyelids granulation tissue at first, scar tissue afterwards, with ultimate inability to close the eyes, keratitis and blindness frequently resulting. The tongue appears to be never involved. The upper lip remains as a bridge, in cases in which the nose has been destroyed, and through the anterior nares one looks into the mouth and throat. Even in the most extensive and aggravated cases, however, there is no evident impairment of the general health."

In May, 1911, Surg. H. E. Odell, United States Navy, in a report on gangosa in Guam, states: "It has been impossible to get the native when the disease is first manifested; but the condition, generally considered, typically begins as a small ulcer on the nasal septum, palate, or fauces, and at that stage is first seen. These ulcerations frequently extended, involving the tissues of the face, eyelids, and eyes, in healing as they generally did after a time, the most horrible scars were produced, eyelids fusing together, and the oral and nasal

cavities being more or less united, frequently leaving as a result of the cicatricial contraction a small opening not more than three-quarters to 1 inch in diameter. On the extremities (the lower being more frequently involved) the ulcerations were more common about the hands and feet, and as a result of the ulceration and contraction deformed and twisted members resulted. Ulcers past and present existed in all parts of the body, usually going to a sufficient depth to cause impairment of function or loss of motion. These conditions differ in no respect from what is frequently seen in cases of neglected syphilis, except that the neglect here has been greater, the ulcers being allowed to take their course unopposed, and when in the course of time healing took place, the contractures and scars were correspondingly greater."

In the April, 1913, number of the United States Naval Medical Bulletin, Past Asst. Surg. W. M. Kerr, United States Navy, writes as follows: "*Gangosa*, a Spanish word meaning 'muffled' or 'nasal' voice, is the name which has been employed in Guam for many years to designate a disease characterized by a destructive ulceration usually beginning on the soft palate, pillars of the fauces, or uvula and extending by continuity to the hard palate, nasal cavity, and even to the face, neck, arms, and thorax. The term for the past few years has included cases of extensive ulceration of the skin and underlying connective tissue, occurring independently of the nasopharyngeal lesions and nodular lesions of bone which have the gross appearance of syphilitic gumma. The disease occurs in both sexes, irrespective of age. It was found more frequently in the outlying rural districts of the island. The etiology has long remained a mystery. The disease has been thought by some to be a manifestation of syphilis. By others it was thought to be a sequela of yaws. Some students of the disease believed it to be a clinical entity. The chronic ulcerations found in Guam and described under the name 'gangosa' were at one time thought to be limited to the Marianas, the Caroline, and Marshall Islands, but cases with nasopharyngeal involvement, similar in appearance to those seen in Guam, have been reported from the Philippines, Fiji, Samoa, Queensland, and the adjacent islands, Papua, Torres Straits Islands, Thursday Island, the West Indies, South America, and Africa." Castellani and Chalmers also report the existence of gangosa in Ceylon, British Guiana, Italy, and Panama. Surg. Leys, from an extensive experience on the Isthmus, denies that it is found in that locality.

Early in 1910, Surg. Odell, then senior medical officer on the island of Guam, noting the strong resemblance to syphilis of certain gangosas with tumors of the long bones and loss of substance and depression of the frontal bones, ordered all gangosas to be given one-fifteenth of a grain of bichloride of mercury and 15 grains of

iodide of potassium in 1 drachm of water three times a day. This dose was considerably increased later on in certain cases, taking into consideration the age and physical condition of the patient and individual toleration and idiosyncracy. This universal antisyphilitic treatment worked wonders in the course of time, and soon an open gangosa lesion was a rarity. In June, 1911, the writer relieved Surg. Odell, and in January, 1912, ordered the mixed antisylphilitic treatment discontinued for six months, except in special cases, as each gangosa had then been taking it for about 18 months. This measure was adopted to give the digestive and absorptive systems a rest and to observe the permanency of the treatment. As a check on the above, all gangosas were ordered to report for examination once a month at the native clinic or nearest dressing station, and the results of these examinations were forwarded to the health officer on a special printed form. As soon as open lesions were noted, the cases were sent to the hospital and from one to three full doses of salvarsan, administered by the intravenous or intramuscular route. Some obstinate leg ulcers and skin lesions in other parts of the body also required the local application of a vaseline ointment, containing 8 per cent of scarlet red, or skin grafting. After leaving the hospital as cured, these cases were ordered to take mixed treatment for six months.

We come now to the etiology of this interesting disease, which has so far remained an enigma, in spite of the careful and painstaking efforts of a number of laboratory workers in Guam and elsewhere. In the study of the cause or causes of gangosa, the following hypotheses should be carefully investigated and such conclusions formulated as the facts seem to warrant: (1) Is gangosa a separate disease, caused by a specific microorganism? (2) Is it a contagious or hereditary disease? (3) Is it a modified form of leprosy or due to localized tuberculosis? (4) Is it a sequel or tertiary stage of untreated frambesia (yaws)? (5) Are its lesions caused by acquired or inherited syphilis?

Taking up these tentative suppositions *seriatim*, we find that a definite specific causative organism has not as yet been found. In January, 1908, Surg. A. J. Geiger, United States Navy, working in the laboratory at the United States Naval Hospital, Guam, isolated a bacillus in the lesions of gangosa, morphologically and in its staining qualities somewhat resembling the *Bacillus diphtheriæ*. This organism was at first thought to be the cause of gangosa or at least to have some connection with its etiology. Later investigation proved that it was not pathogenic and was found in a variety of normal and pathological conditions.

A number of the poorer families in the smaller towns of the island have one or more gangosa members. The latter are not considered

pariahs or even dangerous. They live with the others a primitive family life, sleep on mats in the same room, eat with their fingers from a common dish, smoke the same pipe, etc., without ever having transmitted the disease, so far as is known, to healthy members of the family. The question of hereditary transmission of gangosa can not be definitely settled at present, though in some families it appears to be proven. We have on the list a boy 13 years old, the one gangosa in a family of seven, whose only known gangosa relative was his paternal grandmother. I have seen a typical gangosa father and mother, with five apparently healthy children, and also a gangosa father with two gangosa sons, the mother and remaining children being entirely free from the symptoms of that disease.

As to their family history, the gangosas in Guam can be divided into two classes, the second class having nine subdivisions:

Class 1. Stating that they have no gangosa relatives	100
Class 2. (*a*) Grandparent or grandchild, in various combinations with parent or child, brother or sister, uncle or aunt, and cousin of one or more gangosas	11
(*b*) Parent or child only and in various combinations with brother or sister, uncle or aunt, and cousin of one or more gangosas	64
(*c*) Brother or sister only or in various combinations with uncle or aunt, cousin, or sister-in-law of one or more gangosas	78
(*d*) Uncle or aunt only and aunt and uncle and cousin of one or more gangosas	63
(*e*) Cousin of one or more gangosas	53
(*f*) Wife of gangosa	1
(*g*) Sister-in-law of gangosa	1
(*h*) Niece of gangosa	1
(*i*) Half-brother of several gangosas	1
Total	373

Gangosa victims, with facial mutilation and deformity, greatly resemble lepers, which fact has been commented upon in the past by casual lay and medical visitors to Guam who are not familiar with the symptoms of the first-named disease. The tendency to spontaneous cure in many cases of gangosa, the absence of typical symptoms of leprosy elsewhere, and the fact that lepra bacilli can not be found in the blood, in scrapings from the ulcers, sections of the skin, and in new growths, proves that the two diseases are separate entities, and that gangosa, whatever its cause or causes may be, is not a modified or atypical form of leprosy.

Localized tuberculosis can also be eliminated as a causative factor in gangosa, by reason of the nonexistence of tuberculosis elsewhere, the state of the general health, the infrequency of extension downward into the larynx, and the fact that tubercle bacilli can not be found in any of the lesions.

Frambesia tropica (yaws) is a very common disease in Guam. Cases are rarely seen in the primary stage; usually in the late secondary stage or in the tertiary stage (gangosa?). In the smaller towns and outlying districts, it is estimated that 90 per cent of the natives have yaws in childhood. In Agaña, where hygienic conditions are better, only about 5 per cent are so affected. Though some cases of yaws are quite severe, the natives pay very little attention to them, apparently consider the disease of minor importance and rarely bring their sick children to the hospital or dressing station for treatment unless ordered to do so by a medical officer. A mixture of bichloride of mercury and potassium iodide or potassium iodide alone is the routine internal treatment prescribed; locally a 25 per cent nitrate of silver solution is used. In some cases one or more intravenous or intramuscular doses of salvarsan are also given. The native treatment for the ulcers of yaws, is a mixture of lemon juice and iron rust.

To show the extent of frambesia in Guam, I quote below a summary of an examination of 2,429 normal natives living in Sinajaña, Anigua, Asan, Tepungan-Piti, Sumay, Agat, Umatac, Merizo, Ynarajan, and a part of Agaña, made by Passed Asst. Surg. W. M. Kerr, United States Navy, in February, 1912.

Number of people giving history of yaws, showing yaws scars and scar of mother yaw	1,311
Number of people who did not know if they had had yaws or not, but who showed scars	88
Number of people who did not know if they had had yaws or not, and showed no scars	25
Children under 10 years who never had yaws	534
Number of adults who had never had yaws and who showed no scars	471
Total	2,429

On this island the *Treponema pertenue* has never been found in scrapings or discharges from gangosa lesions or in sections of internal organs, obtained post-mortem. Four gangosas in Table A give a history of onset of yaws, from one to four years after the appearance of gangosa. Three cases on the gangosa list developed this disease less than one year after having yaws and one case did not have gangosa until 62 years after the onset of yaws.

It is interesting in this connection to quote below extracts from an article by Passed Asst. Surg. E. U. Reed, United States Navy, on "Medical work in American Samoa," published in the United States Naval Medical Bulletin, October, 1913. "Frambesia, or yaws, is very prevalent, only a few children escaping the infection. Several cases of chronic and extensive throat ulcerations and ulceration of the nasal septum, with resulting sinking of the bridge of the nose, have been

observed and are believed to have been tertiary yaws, though the treponemata could not be found. They have been cured by salvarsan and potassium iodide in increasing doses.

"Syphilis as it occurs in European races is unknown among the people of American Samoa. The great similarity between the causative organisms and the lesions of these diseases leads me to believe, in spite of experimental evidence to the contrary, that the two diseases were originally the same, and that yaws has been modified by centuries as a disease of children."

Asst. Surg. E. P. Halton, United States Navy, working in the laboratory at the United States Naval Hospital, Guam, during September, 1911, examined the blood of 11 cases of yaws by the Noguchi modification of the Wassermann test and found all to be positive. Twenty-four cases that had had yaws several years previous were examined and 11 found positive and 13 negative. Halton obtained from his Noguchi tests as high a percentage of positive results in yaws as is usually found in syphilis. Primary and secondary syphilis and chancroid are unknown in Guam, and there is no known instance of a white man acquiring syphilis from a native woman. Gonorrhea is the only venereal disease that has been found among the public women or among other natives of Guam, who have been admitted to the hospital or treated at the native clinic. The native enlisted men on the U. S. S. *Supply* have had many opportunities to contract venereal diseases on the numerous trips made by that ship to the Philippines and to various ports of China and Japan. While they have frequently acquired gonorrhea and chancroid, they have so far never developed syphilis.

Since about the end of the eighteenth century, whalers have been accustomed to spend part of the winter in the harbor of Guam. In the middle of the nineteenth century, from 100 to 150 vessels from the Atlantic and Pacific whaling fleets, principally British, spent about one month each winter in the harbor of San Luis D'Apra. The whalers gradually ceased to come to Guam, and between 1887 and 1896, 11 was the largest number in the harbor at one time; they stopped coming entirely in 1903.

During the years prior to the American occupation regular trips between Guam and Manila were made by subsidized Spanish steamers and sailing vessels. In the days before the independence of Mexico sailing ships from Acapulco usually stopped at Guam en route to the Philippine Islands.

From the visits of these ships some medical officers believe that syphilis was introduced into the island of Guam, and that the hereditary form of syphilis, modified by transmission through many gen-

erations, is the disease we now call gangosa. Since the advent of the Americans, syphilis could have only been introduced by the monthly visits of Army transports, the occasional visits of men-of-war and colliers, the frequent arrivals of schooners from Japan, and the U. S. S. *Supply*.

All vessels, on arrival, are boarded by a medical officer, their bills of health carefully scrutinized, and the officers, crew, and passengers examined, whenever this is considered necessary. From the above, it can be seen that it is extremely doubtful that syphilis could have been introduced in this way, and there is no evidence to prove that it ever was.

From acquired syphilis, gangosa may be differentiated by the absence of any signs or history of primary or secondary syphilis and by the onset of gangosa in childhood; from hereditary syphilis, by the absence of any sign of that disease and by its frequent incidence in the healthy children of apparently healthy parents. Also against the hereditary syphilis theory of the origin of gangosa, is the fact that no other syphilitic manifestations, such as insanity, spinal-cord disease, iritis, keratitis, and Hutchinson's teeth are noted, while female gangosas usually bear healthy children and miscarriages are not common among them. The *Treponema pallidum* has, up to the present, never been found in the scrapings and discharges of gangosa lesions, or in post-mortem sections of the internal organs.

Through the kindness of Dr. Hideyo Noguchi, of the Rockefeller Institute, a supply of luetin was sent to Guam for the purpose of testing the cutaneous reactions of all our gangosas. The technique was that recommended in a letter to the writer by Dr. Noguchi, dated April 29, 1913. The skin over the deltoid was first disinfected by a 1–5,000 solution of bichloride of mercury in alcohol, and then 0.07 c. c. of equal parts of luetin and sterile physiological salt solution was injected endermically through a fine hypodermic needle, as superficially as possible. The small puncture was immediately sealed with collodion and the patient observed daily for 10 days or more, to determine the presence or absence of a cutaneous reaction and its type. As a check on the results of the luetin tests, the Noguchi modification of the Wassermann complement fixation test was also made in each case as follows: The fresh active patients' serum was employed with acetone-insoluble lipoids as antigen. The hemolytic system consisted of antihuman rabbit serum as amboceptor, a 40 per cent dilution of guinea-pig serum as complement, and a 1 per cent suspension of washed human red cells. Passed Asst. Surg. E. E. Curtis, United States Navy, carefully and skillfully performed all the laboratory tests for this article, and the results are shown, together with other data from the card index, in Tables A and B.

A study of the 373 gangosas on the official card index, reveals the fact that they can be divided into three separate classes, viz:

(*a*) Gangosas with nasopharyngeal lesions only	120
(*b*) Gangosas with nasopharyngeal lesions and involvement of face, head, neck, body, and extremities	105
(*c*) Gangosas without nasopharyngeal lesions, but involvement of the extremities and various parts of the face, head, neck, and body	148
Total	373

Two hundred and thirteen of the gangosas are females and 160 are males.

The oldest patient now on the list is a man 93 years old, and the youngest a girl 6 years old.

Excluding absentees, 3.04 per cent of the natives actually on the island are afflicted with gangosa.

The luetin and Noguchi tests on the 369 gangosas listed in Table A may be summarized as follows:

Luetin reactions—Curtis, 1913:		Noguchi tests—Curtis, 1913:	
Positive—Class 1—		(*a*) Positive	162
(*a*) Papular	143	(*b*) Weakly positive	61
(*b*) Pustular	65	(*c*) Faintly positive	39
(*c*) Papular-torpid	30	(*d*) Doubtful	23
(*d*) Pustular-torpid	15	(*e*) Negative	84
Negative—Class 2	116	Total	369
Total	369		

NOTE.—Torpid reactions were those requiring 10 days or over.

Summary of the antisyphilitic medication given the gangosas in Table A.

(*a*) Mixed antisyphilitic treatment:	
2½ years	1
2 years	218
1½ years	57
1 year	23
2 to 9 months	19
Total	318
(*b*) Salvarsan, gm. 0.3–0.6 (intravenous or intramuscular injections):	
1 injection	34
2 injections	12
3 injections	1
Total	47
No internal treatment (includes 49 new cases)	51

As over 68.58 per cent of the luetin tests on the gangosas in Table A were positive, we must give due weight to hereditary syphilis as a factor in the origin of gangosa. Ninety-six per cent of the luetin

tests made by Noguchi, in cases of hereditary syphilis, were positive. Therapeutically, mixed antisyphilitic treatment and one or more full doses of salvarsan have practically healed all open gangosa lesions. However, these same remedies are equally efficacious in the treatment of yaws. In spite of the large percentage of positive luetin tests, I am still inclined to believe that gangosa is principally a sequela or tertiary stage of untreated yaws, as that disease is so common among the natives of Guam. Out of the 369 gangosas recorded in Table A, 285, or 77.23 per cent, state they have had yaws; 12, or 3.3 per cent, are doubtful whether they have had the disease or not; and 72, or 19.5 per cent, state they have never had yaws. Primary or secondary syphilis is unknown in this island, and a history of hereditary syphilis can not be obtained from any of the 373 gangosas. An indefinite history of syphilis (tertiary), supposed to have been acquired in San Francisco about May, 1901, can be elicited from a native in Table B. The natives have no word for syphilis in their language, and their name for the extensive deforming gangosa lesions of the extremities means "severe, chronic and incurable yaws." Before arriving at definite conclusions as to the origin of gangosa it will be necessary, in order to eliminate the yaws element in its etiology, to institute compulsory local and internal treatment in all cases of primary and secondary yaws, and watch the effect of this procedure on the future incidence of gangosa. We should also make luetin tests on as many cases of yaws as possible and compare the results with those obtained with this preparation among the gangosas in Table A.

Passed Asst. Surg. Curtis, in October, 1913 (see Table B), made luetin and Noguchi tests on 3 new cases of secondary yaws, obtaining 1 positive and 2 negative luetin reactions and 3 negative Noguchi tests. Asst. Surg. Halton, in September, 1911, got somewhat different results from Noguchi tests in cases of yaws, as the following summary will show:

1. Yaws present at time of test:	
Number of cases	11
Number positive	11
2. History of yaws, one year to many years before:	
Number of cases	24
Number positive	11

The following extract was obtained from the *Münchener Medizinische Wochenscrift* of July 15, 1913:

The intracutaneous reaction in syphilis and frambesia: Baermann and Heinemann, writing from the east coast of Sumatra, report at length on the behavior of these two affections toward luetin and its analogous substance framböitin. Their conclusions are as follows: When either of these extracts is injected intracutaneously in a series of cases of manifest frambesia, a surely positive reac-

tion results. The percentage of positives increases with the duration of the disease, the limitation of the disease focus and the intensity of the specific treatment. The reaction is due probably to the fact that specific solvent bodies dissolve the injected débris of spirochetes, the resulting freed endotoxins determining the phenomena of inflammatory reaction. The latter is temporarily specific, and, reciprocally, the emulsion of one form of spirochete can produce reaction in the opposite disease. The experiments are still under way. Generally speaking, luetin reactions behave much like tuberculin reactions.

At the present time, therefore, we must conclude that although the exact origin of gangosa is unknown, it is probably a tertiary stage or sequel of untreated yaws, combined with a more or less strong element of hereditary syphilis.

Table A.

Initials.	Age.	Sex.	Gangosa lesions. Location.	Gangosa lesions. Began.	Gangosa lesions. Healed.	Yaws. Yes.	Yaws. No.	Yaws. Age.	Evidences of syphilis. Luetin. Date.	Luetin. Result.	Noguchi-Halton. Date.	Noguchi-Halton. Result.	Noguchi-Curtis. Date.	Noguchi-Curtis. Result.	Emery-Crow. Date.	Emery-Crow. Result.	Treatment anti-syphilitic. "606."	Treatment anti-syphilitic. Mixed treatment.
									1913.									*Yrs.*
AAC	16	F.	Septum; nose	1908	1909		No		June 26	Negative	1911	Slightly positive.	1913	Positive	1911	Positive		1½
APC	32	M.	Nose and right leg; throat.	1900	1900	Yes		6 years	July 7	Papular, torpid.	1911	Weakly positive.	1913	do				1½
AQT	24	M.	Left shoulder Left hand and wrist.	1907 1909	1908 1910	Yes		Baby	June 26	Papular			1913	do				1½
AAC	49	F.	Nose and palate	1878	1908		No (?)		June 24	Negative	1911	Negative	1913	do	1911	Positive		2
ACB	22	F.	Nose, palate, and throat.	1901	1911	Yes		Baby	June 26	do	1911	do	1913	Weakly positive.	1911	do		2
ADG	35	F.	Right shin	1910	1910	Yes		22 years	June 27	do	1911	do	1913	Positive				2
AFP	19	F.	Septum; nose	1910	1910		No		July 7	do			1913	do	1911	Positive		½
AMM	38	F.	Right foot and toes.	1904	1913	Yes		Child	June 24	Pustular, torpid.	1911	Weakly positive.	1913	do	1911	do		1½
AQB	54	F.	Face and forehead	1892	1902	Yes		Baby	June 29	Papular	1911	do	1913	Weakly positive.	1911	do	May 6, 1913	1½
AQC	21	F.	Left shin	1909	1910	Yes		Unknown	July 17	Pustular	1911	Positive.	1913	do			Sept. 13, 1912 Oct. 23, 1912	1½
AAT	44	F.	Nose and throat Right knee	1908 1897	1912 1906	Yes		Child	June 26	Papular	1911	do	1913	Positive	1911	Mildly positive.		2
ATT	46	F.	Left upper extremity.	(?)	1910	Yes		do	Aug. 4	do	1911	do	1913	do				2
ACP	30	M.	Nose	1900	1902	Yes		Unknown.	do	do			1913	Negative				1½
AMB	30	M.	Nose and palate	1893	1894		No		June 29	do	1911	Weakly positive.	1913	Weakly positive.				1
ARP	20	M.	Left foot Left knee	1909 1907	1911 1909	Yes		Unknown.	June 30	Negative	1911	Positive.	1913	Positive	1911	Positive		1½
BSS	18	M.	Nose Right leg	1908 1909	1910 1912	Yes		do	June 26	do	1911	Negative	1913	Weakly positive.	1911	do		1½

CCB	24	F.	Nose and throat	1900	1900	Yes		Baby	do	do			1913	Positive	1911	Weakly positive.		2
CMB	46	F.	Nose and throat Upper lip and face	1902 1907	1910 1910	(?)			Aug. 4	do	1911	Positive.	1913	do	1911	Positive		2
CNN	31	F.	Nose, lips, and face	1895	1900	Yes		Baby	June 26	do	1911	Negative	1913	Negative	1911	do		1½
CDS	24	F.	Nose and throat	1910	1910	Yes		Child	June 25	Pustular, torpid.	1911	do	1913	do				1½
CSB	47	F.	Nose and left cheek Left eyebrow	1909 1908	(?) 1910		No		June 28	Pustular	1911	do	1913	Positive	1911	Positive		1½
CLS	62	F.	Right foot and toes Right foot	1895 1912	1896 	Yes		7 years	June 30	do	1911	do	1913	Negative	1911	Negative		1½
DRS	64	F.	Throat	1905	1906	Denied			June 25	Negative	1911	do	1913	Positive	1911	Positive		1½
DFM	41	F.	Face, nose, palate	1893	1903	Does not know			June 26	Pustular			1913	Faintly positive.	1911	Weakly positive.		1½
DST	23	F.	Nose	1906	1912	Yes		(?)	do	Papular	1911	Negative	1913	Negative				1½
DAR	52	F.	do	(?)	1910		No		July 7	do			1913	Positive				1
EPT	51	F.	Both feet and ankles.	1910	1910		No		June 24	Papular, torpid.	1911	Positive.	1913	do	1911	Positive		2
ED	42	F.	Nose, throat, face, eyes.	1883	1887	Yes		(?)	June 25	Pustular, torpid.	1911	Negative	1913	do	1911	do		1½
FSM	49	F.	Nose and throat Face and upper lip Right and left shoulder.	1905 1907 (?)	1910 1910 (?)	Yes		(?)	June 26	Negative			1913	do	1911	do	Feb. 20, 1913	1½
FFM	56	F.	Forehead Throat	1902 1910	1903 1912	Yes		(?)	July 1	Papular, torpid.	1911	Negative	1913	do	1911	do		2
FQC	64	M.	Palate and pharynx	1895	1907	Yes		(?)	July 7	Papular			1913	do				1½
FAR	52	F.	Nose, mouth, pharynx.	1888	1889		No		July 17	Negative	1911	Positive.	1913	do				2
FDSN	26	F.	Left foot, ankle, leg	1904	1910		No		June 26	do	1911	Negative	1913	Negative	1911	Postive		2
FCM	49	F.	Nose, pharynx, lips, face, eyes.	1904	1910	Yes		8 years	June 25	Papular, torpid.	1911	do	1913	do	1911	do		2
FCC	12	M.	Septum and larynx	1912	1913		No		do	Papular			1913	Faintly positive.			Dec. 22, 1912 Jan. 23, 1913 Mar. 19, 1913	[1] 8
FMG	27	M.	Nose, throat, upper lip.	1895	1896	Yes		2 years	June 27	Papular, torpid.	1911	Negative	1913	Negative	1911	Faintly positive.		1
FSP	60	M.	Pharynx	1868	1878	Yes		(?)	June 26	Papular	1911	Weakly positive.	1913	Weakly positive.	1911	Positive		1½
FSY	26	M.	Nose and throat	1908	1910	Yes		4 years	June 29	do	1911	Positive.	1913	Positive				2
FVD	64	M.	Throat and palate	1883	1885	Yes		9 years	do	do	1911	Negative	1913	do				1
GSNC	48	M.	Nose and throat	1885	1886		No		June 26	Papular, torpid.	1911	Positive.	1913	do				1½
JQQ	25	M.	Nose	1910	1910	Yes		(?)	June 29	Pustular	1911	Negative	1913	Negative				1½
JAT	28	M.	Nose, throat, face	1889	1891	Yes		12 years	June 27	Pustular, torpid.	1911	do	1913	do				2
JGM	14	M.	Nose	1907	1910	Yes		5 years	June 30	Negative	1911	Positive.	1913	Positive	1911	Positive		2
JNN	22	M.	Throat	1911	1912	Yes		do	July 1	Papular, torpid.	1911	do	1913	do	1911	do		1

[1] Months.

Table A—Continued.

Initials.	Age.	Sex.	Gangosa lesions. Location.	Began.	Healed.	Yaws. Yes.	Yaws. No.	Yaws. Age.	Luetin. Date.	Luetin. Result.	Noguchi-Halton. Date.	Noguchi-Halton. Result.	Noguchi-Curtis. Date.	Noguchi-Curtis. Result.	Emery-Crow. Date.	Emery-Crow. Result.	Treatment anti-syphilitic. "606."	Treatment anti-syphilitic. Mixed treatment.
									1913.									Yrs.
JRL	41	M.	Ulceration of throat	1883	1885		No		June 28	Papular	1911	Negative	1913	Negative	1911	Negative		1
JSC	16	M.	Nose	1907	1910	Yes		7 years	June 30	do	1911	Weakly positive.	1913	Weakly positive.	1911	Positive		1½
JTT	44	M.	Left leg	1911	1911	Yes		do	July 1	do	1911	Negative	1913	Positive				2
JAG	71	F.	Nose and pharynx	1883	1887		No		June 25	do	1911	Weakly positive.	1913	do	1911	Positive		2
JBD	29	F.	Nose and throat Forehead	1891 1910	1909 1910	Yes		Baby	June 27	do	1911	Positive.	1913	do				2
JPC	31	F.	Nose and lip Left foot and ankle.	1907 1900	1908 (?)		No		June 26	Negative	1911	Negative	1913	do				2
JBB	37	M.	Nose and pharynx	1888	1903		No		June 25	Pustular, torpid.	1911	Positive.	1913	Weakly positive.				2
JDM	54	M.	Nose, forehead, thighs, left shoulder, right ankle.	1903	1910		No		June 27	Negative	1911	Negative	1913	Faintly positive.	1911	Positive		2
JLC	73	M.	Right ankle Right leg	1909 1912	(?) 1913	Yes		(?)	Aug. 4	Papular			1913	Negative				2
JPG	22	M.	Nose and palate	1909	1910	Yes		(?)	June 26	Negative	1911	Weakly positive.	1913	Positive				1½
JSN	93	M.	Nose and throat	1830	1833	Yes		(?)	June 28	Papular			1913	Negative				2
JTS	44	M.	Nose and pharynx	1896	1899	Yes		(?)	June 29	Papular, torpid.	1911	Negative	1913	do				1½
JB	27	F.	Septum	1910	1910	Yes		(?)	do	Papular	1911	do	1913	do	1911	Positive		1½
JSNC	49	F.	Forehead, right leg, right foot, right fore arm.	1895	1909	Yes		10 years	June 26	Papular, torpid.	1911	Weakly positive.	1913	Positive				1½
JSNSN	19	F.	Back of neck, right cheek, right arm, and foot.	1905	1909	Yes		4 years	do	Papular	1911	Positive.	1913	do				2
JS	64	F.	Both feet, face, right eye, frontal bone.	1881	1885		No		do	do	1911	do	1913	do				2
JAA	42	M.	Penis	1910	1910	Yes		Baby	June 24	Pustular, torpid.	1911	do	1913	do				1½

JCA	21	M.	Nose and throat Upper lip and face	1904 1905	1909 1910		No		June 28	Pustular			1913	do	1911	Positive		2
JSC	46	M.	Right hand Right knee, left foot Left foot	1889 1898 1912	1909 1911 (?)	Yes		7 years	June 27	Negative	1911	Negative	1913	Negative	1911	Faintly positive.	June 20, 1913	2
JTN	32	M.	Nose and palate Knees and elbows	1908 1894	1910 1909	Yes		9 years	June 26	do	1911	Weakly positive.	1913	do				1½
JVV	16	M.	Nose Right elbow	1908 1909	1910 1912	Yes		(?)	July 1	do	1911	Negative	1913	do	1911	Positive		1½
JPSN	61	F.	Nose, throat, and lips.	1905	1908		No		June 24	Pustular, torpid.	1911	Positive.	1913	Positive	1911	do		2
JSAC	28	F.	Face forehead, left eye. Throat, shoulders, fore arm. Knees and legs	1902 1902 1902	1909 1903 (?)	Yes		(?)	June 26	Negative	1911	Negative	1913	do	1911	do		2
JBR	47	F.	Nose and shoulder	1895	1903	Yes		5 years	do	Papular	1911	do	1913	do	1911	do		2
JMQ	55	F.	Right ankle and shin.	1867	1869	Yes		Child	June 25	Papular, torpid.	1911	do	1913	Negative				2
LPD	62	M.	Nose and palate Upper lip	1876 1905	1880 1908	Yes		(?)	do	Negative	1911	Positive.	1913	Positive	1911	Faintly positive.		2
LBF	67	M.	Back, neck, eyes, lips, nose, throat, forehead.	1867	1889		No		June 30	do	1911	Negative	1913	do				1½
LST	19	M.	Right leg and ankle. Right leg	1905 1912	1910 (?)	Yes		(?)	June 27	Pustular	1911	Positive.	1913	do				1½
LST	20	M.	Nose	1910	1910		No		Aug. 4	Negative	1911	Negative	1913	Negative	1911	Negative		1½
MBR	29	M.	Nose and palate	1898	1905	Yes		(?)	June 29	Papular	1911	Positive.	1913	Positive				1½
MGG	23	M.	Left foot, shoulder, right elbow.	1908	1909	Yes		Child	July 9	do			1913	Negative				1½
MMR	54	M.	Nose	1876	1877		No		June 25	Pustular	1911	Negative	1913	Positive				2
MQA	47	M.	Shoulders, arms, and legs.	(?)	1910	Yes		2 years	June 29	Pustular, torpid.	1911	Positive.	1913	do	1911	Faintly positive.		2
MCP	47	F.	Nose	1896	1896		No		July 7	Negative			1913	Negative				2
MAA	24	F.	do	1908	1911	Yes		6 years	June 26	do	1911	Weakly positive.	1913	Positive	1911	Positive	Sept. 20, 1912	1½
MBT	42	F.	Right leg and foot	(?)	(?)		No		July 7	Pustular torpid.			1913	Negative				2
MCT	17	F.	Nose Throat	1910 1910	1912 1912		No		do	Negative	1911	Positive.	1913	Positive			June 12, 1912	1½
MSC	32	F.	Nose, throat, face Arms, hands, legs, feet. Hands, legs	1888 1888 1912	1907 1910 (?)		No		Aug. 4	Papular	1911	Negative	1913	Negative				2
MDC	62	F.	Nose, throat, right knee. Left knee and ankle	1882 1912	1883 (?)	Yes		16 years	June 24	Papular torpid.			1913	Weakly positive.	1911	Positive		1
MDA	36	F.	Nose, palate, lip Left arm and hand	1906 1895	1909 1900	Yes		10 years	do	do	1911	Negative	1913	Negative				2
MFG	40	F.	Nose, lip, throat, face, shoulders, left elbow.	1881	1910		No		June 27	Pustular	1911	Positive.	1913	Positive	1911	Weakly positive.		1½

Table A—Continued.

Initials.	Age.	Sex.	Gangosa lesions. Location.	Began.	Healed.	Yaws. Yes.	Yaws. No.	Yaws. Age.	Evidences of syphilis. Luetin. Date.	Luetin. Result.	Noguchi-Halton. Date.	Noguchi-Halton. Result.	Noguchi-Curtis. Date.	Noguchi-Curtis. Result.	Emery-Crow. Date.	Emery-Crow. Result.	Treatment anti-syphilitic. "606."	Mixed treatment.
NGG....	80	F.	Nose and lip.......	1875	(?)	......	No...	....	1913. June 24..	Papular torpid.	......	....	1913	Negative..	......	....	....	*Yrs.* 1½
MLG....	32	F.	Upper lip..........	1910	1910	Yes.	....	28 years...	June 26..	Papular...	1911	Weakly positive.	1913	Positive...	......	....	....	1
MLG....	41	F.	Nose, left leg, feet, toes.	1900	1903	Yes.	....	(?)........	Oct. 22..	Pustular torpid.	1911	Positive.	1913	...do......	1911	Positive...	Mar. 18, 1913; Apr. 4, 1913	2
MGG....	43	F.	Nose, palate, lip...; Left leg, foot, toes..	1895; 1907	1895; (?)	.....	No...	....	June 25..	Papular torpid.	1911	Negative	1913	...do	1911	...do......	....	.....
MLM....	52	F.	Nose, throat, face, forehead, chin, eyelids.	1895	1895?	Yes.	....	10 years...	June 26..	Papular...	1911	...do....	1913	...do	1911	...do......	....	2
MMC....	30	F.	Palate.............	1905	1906	......	No...	....	Aug. 8..	...do......	......	....	1913	...do......	......	....	....	2
MMR....	44	F.	Nose, left hand.....	1895	1910	......	No...	....	June 25..	Pustular..	1911	Negative	1913	Negative..	1911	Positive...	....	2
MRC.....	44	F.	Right breast.......; Upper lip..........	1903; 1903	1908; 1910	Yes.	....	4 years.....	...do	Negative..	1911	...do....	1913	...do......	1911	...do......	....	2
MMG....	35	M.	Nose and palate....	1898	1908	Yes.	....	14 years...	July 1...	Papular torpid.	1911	Weakly positive.	1913	Positive...	......	....	....	1½
NAM....	24	F.	Left cheek, eyelid, nose and pharynx.	1905	1908	Yes.	....	2 years....	July 7...	Negative..	1911	Negative	1913	Negative..	1911	Positive...	....	2
NBB....	45	M.	Nose, palate, face, eyelids.	1901	1908	Yes.	....	(?)........	June 27..	...do......	1911	Faintly positive.	1913	Positive...	......	....	....	2
NSM.....	50	F.	Nose...............	1867	1870	Yes.	....	Child.....	June 25..	Papular torpid.	1911	Negative	1913	...do	......	....	....	1½
PTT.....	16	M.	Perforation of septum.	1911	1912	Yes.	....	5 years....	July 3...	...do......	......	....	1913	...do	......	....	....	1½
PCS.....	28	M.	Face, neck, arms, legs.	Baby	(?)	Yes.	....	Child.....	June 27..	Papular...	1911	Weakly positive.	1913	...do......	......	....	....	1½
PMQ....	52	M.	Nose, throat, face, eyelids, sternum.	1898	1899	Yes.	....	5 years....	June 25..	Negative..	1911	Positive.	1913	Negative..	1911	Positive...	....	1½

PPC	44	M.	Nose, palate, face, lips, forehead, eyelids, ears.	1898	1911	Yes		2 years	June 29	Papular torpid.	1911	Negative	1913	Weakly positive.				2
PYG	27	M.	Nose, lips, face	1908	1910	Yes		8 years	Oct. 11	Negative	1911	do	1913	Positive			Oct. 12, 1912	2
RFA	36	F.	Nose, throat	(?)	1898		No		June 28	Pustular	1911	do	1913	Negative				1½
RGL	48	F.	Nose, palate	1875	1895		No		June 27	Papular	1911	do	1913	Positive	1911	Positive		1½
BMB	60	F.	Face, lips, throat, nose, left eye.	1895	1910	Yes			June 24	Papular torpid.	1911	do	1913	do	1911	Slightly positive.		2
RQG	30	F.	Lips and legs Left foot and toes Right foot	1887 1905 1912	1889 1909	Yes		Baby	do	do			1913	Negative	1911	Positive	Mar. 13, 1913 May 6, 1913	2
RSNB	48	M.	Nose, palate, lips, face, and eyelids.	1900	1908	Yes		14 years	June 27	Papular	1911	Negative	1913	Positive				1½
SG	46	M.	Wrists and ankles Both feet	1905 1912	1911		No		June 24	Pustular	1911	Positive.	1913	Weakly positive.	1911	Positive		2
SL	15	F.	Foot	No date.		Yes		Child	June 25	Negative	1911	Weakly positive.	1913	Faintly positive.				1½
STC	13	F.	Neck	1913	1913	Yes		7 years	July 7	do			1913	Positive			Mar. 10, 1913	1½
SCL	39	F.	Nose, lips, throat Arms Forehead	1890 1887 1906	1891 1889 (?)	Yes		do	June 27	Pustular torpid.	1911	Negative	1913	do	1911	Positive		2
TMF	49	F.	Right leg and ankles Right leg Left leg	1895 1911 1911	1910 1912 (?)	Yes		Child	do	Papular	1911	Positive.	1913	do	1911	do		2
VCS	40	F.	Nose, lips, chin	1902	1904		No		do	Negative	1911	Negative	1913	Faintly positive.				1½
VCT	49	F.	Outside nose	1901	1910		No		do	Pustular torpid.			1913	Positive	1911	Positive		1½
VMB	56	F.	Right arm Right foot Left leg	(?) (?) (?)	1910 1908 (?)	Yes		19 years	do	Papular	1911	Weakly positive.	1913	Weakly positive.	1911	do		2
VAT	43	M.	Nose and throat	1897	1908	Yes		24 years	do	Pustular	1911	Negative	1913	Negative				1½
VBC	38	M.	Palate, lips, throat.	1905	1910	Yes		12 years	June 30	Negative	1911	do	1913	Positive				2
VDA	34	M.	Forehead Left leg Left ankle	1905 1900 1909	1905 1900 1912	Yes		22 years	June 24	Papular	1911	do	1913	Negative				2
YDM	24	M.	Nose, palate, pharynx.	1905	1910	Yes		(?)	do	do	1911	Weakly positive.	1913	Faintly positive.	1911	Weakly positive.		2
YDA	25	M.	Palate	(?)	(?)	Yes		(?)	June 26	Negative	1911	Negative	1913	Positive				1½
YDT	19	M.	Right leg, left knee, and ankle.	1900	(?)	Yes		7 years	Aug. 4	do	1911	Faintly positive.	1913	Faintly positive.			June 29, 1913	2
JDA	15	M.	Nose, soft palate Orbital fossæ	1907 1907	(?) (?)	Yes		8 years	July 7	do			1913	Positive			Sept. 8, 1912	[1]8
JST	12	M.	Left leg Left shin	1913 1913	1 mo. 1 mo.	Yes		do	do	do			1913	do			Feb. 6, 1913	[1]6
JNT	11	M.	Face, neck, right foot.	1908	1910	Yes		5 years	July 3	Pustular torpid.			1913	Weakly positive.			Jan. 12, 1913	2

[1] Months.

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Table A—Continued.

Initials.	Age.	Sex.	Gangosa lesions.			Yaws.			Evidences of syphilis.								Treatment anti-syphilitic.	
									Luetin.		Noguchi-Halton.		Noguchi-Curtis.		Emery-Crow.			
			Location.	Began.	Healed.	Yes.	No.	Age.	Date.	Result.	Date.	Result.	Date.	Result.	Date.	Result.	"606."	Mixed treatment.
									1913.									*Yrs.*
JSC	13	M.	Nose	1908	1912	Yes		3 years	Oct. 17	Pustular	1911	Positive.	1913	Weakly positive.				1½
MGG	17	F.	Nose and upper lip.	1912	1912	Yes		5 years	July 7	Negative			1913	Faintly positive.			Sept. 10, 1912	[1] 9
MCL	45	F.	Palate, larynx, nose, forehead, face.	1910	(?)	Denied.			June 26	Papular torpid.			1913	Positive			Oct. 12, 1912	[1] 6
MPA	30	F.	Neck, head, chest Right forearm Right leg	1901 1906 1911	1903 1906 1913		No		June 30	Negative			1913	Faintly positive.			Jan. 27, 1913	1
MSY	28	F.	Nose, throat, palate Forehead, left knee.	1901 1912	1910 No	Yes		Child	June 25	Papular	1911	Positive.	1913	Positive	1911	Positive	Jan. 12, 1913	2
NWSN	33	F.	Throat	1913	1913		No		July 7	do			1913	Doubtful			May 3, 1913	[1] 2
RSS	40	F.	Chest, forehead Left leg Left thigh	1900 1901 1910	1901 1905 1913	Yes		Child	July 3	do			1913	Weakly positive.			Oct. 11, 1912	[1] 9
RCC	13	F.	Right ankle and foot.	1911	1913	Yes		do	July 3	do			1913	do			Mar. 13, 1913	[1] 6
SPG	14	F.	Wrist, legs, feet Nose	1902 (?)	1910 1910	Yes		3 years	Oct. 19	do	1911	Positive.	1913	Positive				2
SPG	28	F.	Nose Right leg	1905 1905	(?) 1913	Yes		12 years	Oct. 22	do	1911	Negative	1913	Negative			Apr. 11, 1913	2
AVR	64	F.	Both feet	1907	1910	Yes		Child	June 29	Negative	1911	do	1913	do				2
DCP	46	F.	Throat and palate	1908	1912		No		Oct. 17	Pustular	1911	Positive.	1913	Positive				2
NCC	17	F.	Feet and ankles Hands Both legs	1905 1905 1913	(?) 1910 No	Yes		(?)	July 3	Papular	1911	Weakly positive.	1913	do	1911	Positive	Feb. 17, 1913 July 21, 1913	½
LRB	20	F.	Right leg, thigh Right arm Left side of forehead	1911 1911 1913		Yes		1 year	June 26	Negative			1913	do			Feb. 17, 1913	[1] 3
GAF	47	F.	Both feet, legs	1912	No.		No		Oct. 15	do			1913	do				1½
CAT	58	F.	Nose, throat	1870	1871	Yes		2 years	Oct. 21	Pustular			1913	do				
AM	29	F.	Sternum	1910	1911	Denied.			Oct. 20	Papular			1913	Faintly positive.				

MTR	15	M.	Right occipital region. Nasal septum	1913 1913	No. No.		No.		Oct. 26	Pustular			1913	Positive			May 22, 1913	[1] 3
ARB	17	F.	Nasal septum gone.	1902	1904	Yes		6 years	Oct. 9	Negative			1913	Faintly positive.				
TMC	15	F.	Both feet	1912	1912		No.		do	do			1913	Negative				
AVC	40	F.	do	1889	1892		No.		do	do			1913	Weakly positive.				
JGC	40	F.	Soft palate gone; left side nose.	1898	1899	Yes		2 years	do	Papular			1913	Doubtful				
EDG	81	M.	do	1850	1851	Yes		Child	Oct. 18	Papular torpid.			1913	Faintly positive.				
VMP	21	M.	Nasal septum and soft palate gone.	1907	1908	Yes		3 years	Oct. 28	Papular			1913	Positive				
LPL	46	F.	Nose	1903	1903		No.		Oct. 20	Papular torpid.			1913	Weakly positive.				
VP	42	F.	Soft palate gone	(?)	(?)		No.		Oct. 31	Pustular			1913	do				
JFM	24	F.	Neck	1889	1897	Yes		Child	Oct. 19	Negative			1913	Positive				
JAS	21	M.	Septum perforated.	1903	1904	Yes		do	Oct. 26	Pustular			1913	Doubtful				2
LB	36	M.	Both shins	1895	1896	Yes		do	Oct. 18	Negative			1913	Faintly positive.				
MD	40	F.	Soft palate gone	1897	1898	Yes		25 years	do	Papular			1913	Positive				
FCS	18	M.	Throat	1911	1911		No.		Oct. 11	do			1913	Doubtful				2
MSS	12	M.	Nasal septum, right side nose.	1907	1908	Yes		6 years	Oct. 20	do			1913	Positive				1
AG	63	F.	Upper lip soft palate.	1898	1898		No.		Oct. 23	Pustular			1913	Weakly positive.				
NC	60	F.	Part nasal septum gone.	1899	6 mo.	([2])			Oct. 27	Papular			1913	Negative				
RPS	23	F.	Nasal septum and soft palate gone.	1906	1906	Yes		Child	Oct. 25	Pustular			1913	Weakly positive.				
EDC	63	F.	Scar tissue both feet and legs.	1888	1897		No.		Oct. 18	Papular			1913	do				
MCL	19	F.	Sternum, blind right eye.	1910	1911		No.		Oct. 20	do			1913	Positive				
MJLT	21	F.	Back, arms, legs. Nares	1907 1912	1909 1912	Yes		Child	Oct. 8	Papular torpid.			1913	Weakly positive.				2
VSS	35	F.	Nasal septum perforated, soft palate gone.	1883	1884	Yes		5 years	do	Negative			1913	do				
FCP	47	F.	Nasal septum perforated, pharynx.	1912	1913	Yes		6 years	do	do			1913	Positive				
JAT	34	M.	Soft palate gone	1911	1912	Yes		10 years	do	Papular			1913	do				
NPS	34	F.	do	1892	1893	Yes		4 years	do	Negative			1913	Negative				
AGS	22	F.	Soft palate perforated, pharynx.	1902	1903	Yes		3 years	do	Papular			1913	Positive				
IPS	25	F.	Mouth, nasal septum.	(?)	(?)	([2])			do	Pustular	1911	Negative	1913	do				

[1] Months.

[2] Does not know.

TABLE A—Continued.

Initials.	Age.	Sex.	Gangosa lesions. Location.	Gangosa lesions. Began.	Gangosa lesions. Healed.	Yaws. Yes.	Yaws. No.	Yaws. Age.	Evidences of syphilis. Luetin. Date.	Evidences of syphilis. Luetin. Result.	Evidences of syphilis. Noguchi-Halton. Date.	Evidences of syphilis. Noguchi-Halton. Result.	Evidences of syphilis. Noguchi-Curtis. Date.	Evidences of syphilis. Noguchi-Curtis. Result.	Evidences of syphilis. Emery-Crow. Date.	Evidences of syphilis. Emery-Crow. Result.	Treatment anti-syphilitic. "606."	Treatment anti-syphilitic. Mixed treatment.
									1913.									*Yrs.*
ETB.....	46	F.	Nose, throat, face, lips, left heel, toes.	1904	1910	Yes.......		9 years....	Oct. 3	Pustular..	1911	Negative	1913	Weakly positive.	.....	....	....	2
FTB.....	38	M.	Left leg........... Forehead, right hand, left foot, and ankle.	1912 1898	(?) 1910	Yes.......		Baby......	...do.....	Papular...	1911	...do.....	1913	Positive...	.....	....	....	1½
CLTT....	39	F.	Nose, pharynx, both legs, left arm.	1893	1896	Yes.......		Child......	...do.....	Negative..	1911	...do....	1913	Weakly positive.	.....	....	....	2
RQR.....	51	F.	Nose, lips, pharynx.	1873	1877	Yes.......		2 years....	...do.....	Papular...	1911	Positive.	1913	Negative..	.....	....	....	2
CSNM....	32	F.	Face............... Left leg and foot...	1899 1898	1910 (?)	Yes.......		Baby......	...do.....	Negative..	1911	Negative	1913	Positive...	.....	....	....	2
VFSN....	12	M.	Right ankle........	1908	1910	Yes.......		(?)........	Oct. 11	...do......	1911	Positive.	1913	Weakly positive.	.....	....	....	2
NSA.....	38	M.	Left elbow......... Nose...............	1908 (?)	1910 (?)	Yes.......		(?)........	Oct. 8	Papular...	1911	Negative	1913	Negative..	.....	....	....	2
MSF.....	12	M.	Left leg and foot, right hand, ears.	1908	1910	Yes.......		6 years....	...do.....	Negative..	1911	...do.....	1913	Weakly positive.	.....	....	....	2
DCL.....	39	F.	Right foot, ankle, shin.	1905	1905	(1)	....	....	...do.....	Pustular..	1911	...do.....	1913	Doubtful..	.....	....	....	2
JFS.....	42	M.	Nose, pharynx.....	1903	1910	Yes.......		(?)........	...do.....	Papular...	1911	Weakly positive.	1913	Negative..	.....	....	....	2
MTT.....	28	M.	Left hand, fingers, left leg, neck.	1893	1901	Yes.......		2 years....	...do.....	...do......	1911	Negative	1913	Weakly positive.	.....	....	....	2
DSM.....	39	F.	Nose, pharynx, lips.	1875	1907	Yes.......		Baby......	...do.....	...do......	1911	...do.....	1913	Negative..	.....	....	....	2
MTT.....	50	F.	Nose, throat, lips..	1893	1903	Yes.......		14 years...	...do.....	...do......	1911	...do.....	1913	...do......	.....	....	....	2
JF.......	16	M.	Right leg..........	(?)	(?)	Yes.......		Child......	...do.....	...do......	1911	...do.....	1913	Positive...	.....	....	....	2
LN.......	6	F.	Left elbow, right leg.	1910	1912	Yes.......		(?)........	...do.....	...do......	1911	Positive.	1913	Doubtful..	1911	Positive...	....	2
LPM.....	16	M.	Left ankle.........	1908	1910	Yes.......		Baby......	...do.....	Negative..	1911	...do.....	1913	Positive...	.....	....	....	2

MPS	37	F.	Nose, throat, elbow, wrist, right shoulder.	1908	1909	Yes		13 years	Oct. 10	...do	1911	Negative	1913	...do				2
PSA	16	M.	Nose	1908	1910	Yes		(?)	Oct. 8	...do	1911	Weakly positive.	1913	Weakly positive.				2
RAM	24	F.	Cornea Feet	1908 1909	1910 1908	Yes		16 years	...do	Papular	1911	Positive.	1913	Positive				2
MAS	45	F.	Legs and angles	1907	1908	Yes		Child	...do	...do	1911	Negative	1913	Faintly positive.	1911	Positive		1½
MCL	8	F.	Nose, lips, face Pubes, buttocks	1909 1910	1910 1910	Yes		5 years	Oct. 16	Pustular	1911	Positive.	1913	Positive	1911	...do		2
TMU	62	M.	Nose and palate	1862	1908	Yes		Child	Oct. 17	Papular	1911	Negative	1913	Negative				2
RBB	54	F.	Nose, palate, pharynx, larynx.	1905	1908	Yes		...do	...do	Pustular	1911	...do	1913	Doubtful				2
JRD	39	F.	Nose, throat, lips	1883	1906	Yes		...do	Oct. 16	Negative	1911	...do	1913	Weakly positive.				2
FBR	21	M.	Nose, palate	1905	1909	Yes		1 year	Aug. 25	...do	1911	Positive.	1913	...do				2
CBR	17	F.	...do Upper lip	1905 1906	1908 1908	Yes		Child	Oct. 16	...do	1911	...do	1913	...do				2
CSS	20	M.	Nose, right foot	1910	1910	Yes		13 years	Aug. 25	Papular	1911	...do	1913	...do				2
JBB	28	M.	Left leg, nose, pharynx.	1904	1909	Yes		7 years	Oct. 16	Pustular	1911	Negative	1913	Negative				2
JAR	46	F.	Both legs Left leg	1892 1912	1892 (?)		No		...do	...do	1911	Positive.	1913	Positive				2
JSD	65	M.	Nose, scrotum	1911	1912	Yes		30 years	Oct. 17	...do			1913	Negative				2
CS	23	F.	Both shins	1896	1898	Yes		Child	Oct. 23	Negative			1913	Weakly positive.				
VdlC	40	M.	Soft palate	1898	1899	Yes		...do	...do	...do			1913	...do				2
FSGM	47	M.	Nose	1904	1908		No		Oct. 17	Papular	1911	Weakly positive.	1913	Positive				2
FSNE	32	F.	Left arm, hand, wrist, fingers.	1906	1909	Yes		(?)	Oct. 16	Pustular	1911	Positive.	1913	...do				2
FBT	16	F.	Both knees, left forearm, pharynx.	1911	(?)	Yes		10 years	Oct. 17	Negative			1913	Doubtful			Aug. 20, 1912	1
JCD	41	F.	Left shoulder, arm, hand.	1900	1908	Yes		15 years	Oct. 21	...do	1911	Negative	1913	Weakly positive.				2
JCD	49	F.	Right leg, ankle	1902	1910	Yes		10 years	Oct. 17	Papular torpid.	1911	Weakly positive.	1913	Positive				2
JEN	22	F.	Both shins	1906	1908	Yes		Child	...do	Negative			1913	Faintly positive.				
JNP	15	M.	Right shoulder Left arm, wrist	1908 1908	1910 1912	Yes		7 years	Aug. 25	Pustular	1911	Positive.	1913	Positive				1
ABC	38	F.	Nose, throat, eyes, face.	1904	1910	Yes		10 years	Oct. 18	Papular	1911	...do	1913	...do				2
MPG	30	F.	Nose	1905	1908	Yes		9 years	Oct. 19	Negative	1911	Negative	1913	Faintly positive.				2
JAT	72	F.	Left foot, leg, knee	1902	1912	Yes		33 years	Oct. 21	...do	1911	Positive.	1913	Weakly positive.				1

[1] Does not know.

TABLE A—Continued.

Initials.	Age.	Sex.	Gangosa lesions. Location.	Gangosa lesions. Began.	Gangosa lesions. Healed.	Yaws. Yes.	Yaws. No.	Yaws. Age.	Evidences of syphilis. Luetin. Date.	Luetin. Result.	Noguchi-Halton. Date.	Noguchi-Halton. Result.	Noguchi-Curtis. Date.	Noguchi-Curtis. Result.	Emery-Crow. Date.	Emery-Crow. Result.	Treatment anti-syphilitic. "600."	Treatment anti-syphilitic. Mixed treatment.
AG	21	F.	Nose, throat	1908	1910	Yes		(?)	1913. Oct. 6	Papular	1911	Positive.	1913	Faintly positive.				2
JLSN	75	M.	Right hand, right forearm, left leg, ankle.	1905	1909	Yes		6 years	Oct. 17	Pustular	1911	Negative	1913	Negative				2
JBL	13	M.	Right wrist, shin Left knee	1906 1910	1910 No.	Yes		3 years	Oct. 15	Papular	1911	do	1913	do				2
JASN	15	M.	Nose, throat	1909	1910	Yes		2 years	do	do	1911	Positive.	1913	do				2
DASN	22	F.	Nares, upper lip, back of neck.	1908	1909	Yes		(?)	Oct. 21	Pustular	1911	Negative	1913	do				2
DSNSN	42	F.	Nose, face, throat, forehead.	1892	1893	Yes		9 years	Oct. 18	Papular	1911	do	1913	do				2
NCP	35	F.	Left foot, forehead.	1909	1910		No		do	do			1913	Positive				2
PCC	29	M.	Nose, throat	1906	1910	(?)		(?)	Oct. 17	Pustular	1911	Negative	1913	do				2
LT	40	F.	Soft palate, nasal septum gone.	1898	1899		No		Oct. 19	Papular			1913	Doubtful				
JSC	28	M.	Nose, palate, pharynx.	1897	1910	Yes		10 years	Oct. 17	Pustular	1911	Negative	1913	Positive	1911	Positive		2
JTP	34	M.	Right leg Left leg	1908 1899	1912 1905		No		Oct. 16	Negative	1911	Positive.	1913	Weakly positive.	1911	do		
SYR	29	M.	Nose, throat	1907	1910	Yes		7 years	do	do	1911	Negative	1913	Faintly positive.				2
JRD	39	M.	Throat	(?)	(?)	Yes		20 years	do	do	1911	do	1913	Doubtful				2
MJ	16	F.	Soft palate	1903	1903	Yes		1 year	do	Pustular			1913	do				
JTB	16	M.	Nose, throat, lips, face.	1905	1910	Yes		5 years	Aug. 25	Papular	1911	Positive.	1913	Weakly positive.			Jan. 1, 1912	
FST	39	F.	Nose, palate, right forearm, left shoulder, left leg.	1905	1908	Yes		2 years	Oct. 17	Negative	1911	do	1913	Positive				2
RSS	37	F.	Nose, face	1901	1902	Yes		5 years	do	Pustular	1911	do	1913	Negative				2
JRT	26	M.	Nose, left foot	1905	1910		No		Oct. 16	Pustular torpid.	1911	Negative	1913	Weakly positive.				2

B	40	F.	Perineum, either side of anus.	1909	1910	Yes		24 years	do	Papular	1911	do	1913	Positive				2
JCM	52	F.	Nose, palate, lips	1881	1881	(?)		(?)	do	Papular torpid.	1911	Positive.	1913	Negative				2
ACC	50	F.	Palate, neck, right leg, right shoulder.	1904	1909	Yes		(?)	do	do	1911	do	1913	Doubtful				2
AJE	44	F.	Left leg	1903	1908	Yes		Child	do	do	1911	do	1913	Negative				2
ABR	20	F.	Nose, throat	1906	1909	Yes		do	do	Negative	1911	do	1913	Faintly positive.				
DCP	44	F.	Right heel, left leg Left foot	1903 1912	1910 1912	(?)		(?)	do	do	1911	do	1913	Positive				2
DLGD	29	F.	Nose	1911	1911	Yes		24 years	Oct. 18	Papular	1911	do	1913	do				2
EJ	31	F.	Both arms and legs. Back left hand	1910 1912	(?) (?)	Yes		3 months	Oct. 19	do	1911	do	1913	do				2
GMD	38	M.	Right forearm	1912	(?)	Yes		5 years	Oct. 17	do			1913	Doubtful				1
JTC	22	M.	Nose and throat	1910 1912	1911 1912	Yes		4 years	do	Papular torpid.	1911	Positive.	1913	Weakly positive.			June 18, 1912	2
JYR	17	M.	Left knee, leg, foot	1906	1910	Yes		(?)	Oct. 28	Pustular			1913	do				1
MLA	32	F.	Nose and throat	1906	1906	Yes		7 years	Oct. 16	Papular	1911	Negative	1913	Negative				2
MSA	24	F.	Throat	1910	1910	Yes		8 years	Oct. 17	do	1911	Positive.	1913	Positive				2
MSS	7	F.	Right foot	1913 1911	1913 1912	Yes		2 months	do	do			1913	Weakly positive.			Apr. 10, 1913	[1] 6
MTB	12	F.	Nose	1910	1910	Yes		4 years	Oct. 16	Negative	1911	Faintly positive.	1913	Negative				2
SCL	38	M.	Nose and palate	1910	1910	Yes		5 years	Oct. 19	Papular			1913	Positive				2
STM	19	F.	Right leg	1910	1911	Yes		do	Oct. 16	Papular torpid.			1913	do				2
VQQ	30	F.	Right leg and foot Right arm and shoulder.	1909 1907	1910 1909	Yes		Child	Oct. 20	Papular			1913	do				2
MTM	42	F.	Nose and throat	1883	1884		No		Oct. 11	Pustular			1913	Negative				1
MLQ	76	F.	Right leg, ankle, right arm, and hand.	1898	1908	Yes		(?)	Oct. 23	do			1913	Positive				2
RBG	16	M.	Eyebrow, nose, lip, right cheek.	1908	1910	Yes		(?)	Oct. 11	do			1913	do				2
LSA	28	M.	Left leg	1913	No.	Yes		20 years	Oct. 20	Negative			1913	Faintly positive.				
SSA	22	M.	Nose, face, hands, feet. Left foot	1895 1912	1910 No.	Yes		(?)	do	Papular			1913	Weakly positive.				2
MSA	24	F.	Left foot and toes	1908	1910	Yes		(?)	do	do			1913	Negative				2
ECS	18	F.	Left foot, right elbow.	1896	1898	Yes		1 year	do	Pustular			1913	Doubtful				
VCT	27	M.	Lips	1892	1896	Yes		(?)	do	Papular			1913	Positive				2
RFC	25	M.	Nose, throat	1900	1901	Yes		(?)	Oct. 15	do			1913	do				2
MTC	51	M.	Both shins Right shin	1905 1912	1910 1912	Yes		(?)	Aug. 25	Negative			1913	Weakly positive.				2
MCC	31	F.	Right knee, leg, ankle.	1890	1909	Yes		(?)	Oct. 20	Pustular			1913	Negative				2

[1] Months.

Table A—Continued.

Initials.	Age.	Sex.	Gangosa lesions. Location.	Began.	Healed.	Yaws. Yes.	No.	Age.	Evidences of syphilis. Luetin. Date.	Result.	Noguchi-Halton. Date.	Result.	Noguchi-Curtis. Date.	Result.	Emery-Crow. Date.	Result.	Treatment anti-syphilitic. "606."	Mixed treatment.
									1913.									*Yrs.*
JLA	45	M.	Soft palate perforated.	(?)	(?)		No.		Oct. 11	Papular			1913	Negative				
NM	30	F.	Both ankles	1903	1904	Yes		12 years	do	do			1913	Positive				
PBB	45	M.	Right foot, ankle Right foot	1906 1912	1911 (?)	Yes		(?)	do	Pustular			1913	Weakly positive.				2
FFN	19	M.	Ant. neck	1912	(?)	Yes		(?)	Oct. 14	Negative	1911	Positive.	1913	Negative			Jan. 4, 1913 Jan. 23, 1913	2
PSNE	40	F.	Both shins	1913	3 mo.		No.		Oct. 11	do			1913	Positive				
RFA	51	F.	Nose, palate, right hand, right wrist.	(?)	(?)	Yes		(?)	do	Pustular			1913	do				2
FBB	19	F.	Left arm, left hand, both legs, and feet.	1907	1911	Yes		(?)	Oct. 24	do	1911	Negative	1913	Negative				2
VTB	42	M.	Nose, palate, face Pharynx, eyes, lips.	1887 1912	1908 (?)	Yes		(?)	Oct. 11	Papular	1911	do	1913	do				2
DFA	39	F.	Right foot, ankle, shin.	1905	1905		No.		do	Negative	1911	do	1913	Faintly positive.				2
ACF	11	F.	Left knee and foot	1906	1910	Yes		(?)	do	Papular	1911	Weakly positive.	1913	Positive				2
ACF	13	M.	Nose	1909	1910	Yes		(?)	do	do			1913	do				2
FMC	18	M.	Nose and pharynx	1905	1908	Yes		(?)	do	do	1911	Negative	1913	Negative				2
BMC	25	M.	Nasal septum and soft palate.	1898	1899	Yes		Child	do	Negative			1913	Faintly positive.				
SAC	49	F.	Right shoulder	1891	1896	Yes		9 years	do	do			1913	Positive				
AA	24	F.	Left ankle	1913	2 mo.	Yes		7 years	do	do			1913	do				
AMC	35	F.	Right hand, left shoulder. Right hand, right shoulder.	1906 1911	1906 1911	Yes		11 years	do	Papular			1913	Faintly positive.				1
YCU	53	F.	Nose, throat, face Forehead, left ear, arms.	1895 1906	1896 1910	Yes		(?)	do	do	1911	Positive.	1913	do				2

JMC	24	F.	Knees, ankles, nose, forehead, right elbow, eyes.	1900	1909	Yes		(?)	..do	..do			1913	Negative				2
MAF	26	F.	Legs and ankles	1904	1908	Yes		(?)	..do	Negative	1911	Positive.	1913	Positive			Mar. 25, 1913 Apr. 11, 1913	2
PCC	22	M.	Nose	1910	1910	Yes		(?)	..do	Pustular	1911	..do	1913	Doubtful			June 17, 1913 Oct. 10, 1913	2
FALG	32	M.	Nose, palate, pharynx.	1891	1893	Yes		8 years	..do	Negative	1911	Negative	1913	Positive				2
CNA	32	F.	Nose and forehead	1895	1900	Yes		(?)	..do	Papular	1911	..do	1913	..do				2
DFN	11	F.	Right foot Nose	1908 1908	1908 1910	Yes		(?)	..do	..do			1913	Weakly positive.				2
JNF	39	M.	Right leg Left leg	1905 1905	1909 (?)	Yes		5 years	..do	..do	1911	Positive.	1913	Positive	1911	Positive		2
JBN	12	M.	Right leg	1908	1910	Yes		4 years	..do	Negative	1911	..do	1913	..do				2
LRM	28	M.	Left leg and thigh Left chest, left lumbar.	1911 1897	1912 1909	Yes		5 years	..do	Papular			1913	..do			Mar. 25, 1913 Apr. 11, 1913	2
RBT	15	F.	Right foot	1908	1909	Yes		(?)	..do	Negative			1913	..do				
TCD	25	F.	Nose	(?)	1910	Yes		(?)	..do	..do			1913	Negative				1
YAB	18	M.	Right elbow	1908	1912	Yes		12 years	..do	Pustular			1913	Weakly positive.				1
RT	11	M.	Left foot	1908	1909	Yes		Child	..do	..do			1913	Positive				1
DMC	19	F.	Left index finger	[1] 1911	[2] 1911	Yes		5 years	..do	..do			1913	Faintly positive.			June 10, 1912	1
FUJ	17	F.	Nose, throat Right hand, leg Right leg	(?) 1902 1912	(?) 1910 1912	Yes		Child	Oct. 10	Negative	1911	Negative	1913	..do			Mar. 12, 1913	2
NQC	28	F.	Right knee	1908	1909	Yes		5 years	Oct. 13	Pustular	1911	..do	1913	Negative				2
JCC	22	M.	Nose, throat	1908	1910	Yes		..do	Aug. 25	Negative	1911	..do	1913	Weakly positive.				2
RFC	18	F.	..do	1905	1909	Yes		9 years	Oct. 12	Pustular	1911	Positive.	1913	Faintly positive.				2
BCT	22	F.	Knees, ankles	1910	1910	Yes		3 years	Oct. 13	Papular			1913	Positive				2
SBSN	32	F.	Neck, chest, breast Nose	1908 1900	1910 1901	Yes		6 years	Oct. 12	..do	1911	Positive.	1913	..do				2
PAT	25	F.	Nose, lips Throat	1907 Child	1911 Child	Yes		7 years	Oct. 13	Negative	1911	Negative	1913	Negative				2
JFSN	29	M.	Nose, pharynx	1900	1901		No		..do	Papular	1911	..do	1913	Faintly positive.				[3] 4
LBD	46	M.	Left leg and foot	1900	1906	Yes		6 years	Oct. 14	Pustular	1911	..do	1913	Positive				2
FBD	18	M.	Both shins	1913	1913	Yes		Child	Oct. 13	Papular			1913	Faintly positive.				
JBD	15	M.	Elbows, hands Right leg	1906 1912	1908 1912	Yes		5 years	Oct. 15	Negative	1911	Negative	1913	Negative				2
ABD	12	M.	Nose	1910	1910	Yes		3 years	Oct. 14	..do	1911	Positive.	1913	Positive				2
ABD	12	F.	Left shin	1913	1913	Yes		Child	..do	..do			1913	..do				2
RCA	17	F.	Arms and body	1903	1908	Yes		..do	Oct. 13	Papular	1911	Positive.	1913	Weakly positive.				2
AY	19	M.	Nose and palate	1911	No	Yes		6 years	..do	Negative			1913	Doubtful			Oct. 12, 1912	1
CCA	34	F.	Nose, left shoulder	1909	1911		No		..do	Papular	1911	Positive.	1913	Positive				2

[1] First month.
[2] Seventh month.
[3] Months.

TABLE A—Continued.

Initials.	Age.	Sex.	Gangosa lesions.			Yaws.			Evidences of syphilis.								Treatment anti-syphilitic.	
									Luetin.		Noguchi-Halton.		Noguchi-Curtis.		Emery-Crow.			
			Location.	Began.	Healed.	Yes.	No.	Age.	Date.	Result.	Date.	Result.	Date.	Result.	Date.	Result.	"606."	Mixed treatment.
MDD	42	M.	Legs, left arm	1900	1910	Yes		6 years	1913. Aug. 12	Pustular	1911	Positive.	1913	Positive	1911	Positive		2
RSS	22	F.	Right leg, foot and knee. Right ankle	1902 1912	1910 (?)		No.		Oct. 13	do.			1913	Negative			July 21, 1913	2
FCC	18	F.	Right knee	1906	1907	Yes		Baby	Oct. 12	Papular	1911	Positive.	1913	Positive				2
MSNSN	19	M.	Right leg	1906	1912	Yes		12 years	do.	Pustular			1913	Negative	1911	Faintly positive.		2
ACD	19	F.	Nose	1909	1910	Yes		2 years	do.	Papular	1911	Weakly positive.	1913	Positive				2
DMQ	23	F.	Labia majora and right ankle.	1909	1910	Yes		(?)	Oct. 14	do			1913	Weakly positive.				1
JCL	47	M.	Left leg Left ankle	1906 1911	1907 1912	Yes		(?)	do.	do.			1913	Positive				2
MTD	20	F.	Left ankle	1907	1907	Yes		2 years	do.	Negative	1911	Negative	1913	Faintly positive.				1
RNC	22	F.	Nose	1908	1908	Yes		6 years	Oct. 15	do.	1911	Positive.	1913	Positive				2
PTS	22	M.	Nose, neck, chest Nose	1900 1912	(?) (?)	Yes		(?)	Oct. 14	do.	1911	do.	1913	Faintly positive.				2
RPA	46	F.	Forehead, left cheek	1907	(?)	Yes		(?)	do.	do.	1911	Negative	1913	Negative				2
UNT	28	M.	Left leg Right leg Left foot	1906 1906 1912	1912 1911 (?)	Yes		10 years	Oct. 15	Papular			1913	Positive				2
RAM	92?	M.	Arms, legs, feet	1904	1910	Yes		(?)	Oct. 17	do.	1911	Positive.	1913	Negative				2
JMC	32	M.	Nose	1910	1913	Yes		1 year	Oct. 19	do.	1911	do.	1913	Positive				2
MN	62	M.	Soft palate	1867	1868	Yes		Child	Oct. 14	Negative			1913	Faintly positive.				
DCT	64	M.	Right hand, left leg, left foot, left elbow.	1906	1910	Yes		49 years	do.	Papular	1911	Negative	1913	Weakly positive.			Oct. 12, 1913	2
MNT	21	M.	Nose Right great toe	1912 1907	(?) 1910		No.		do.	do.	1911	Positive.	1913	Doubtful				2

FN	60	M.	Face, forehead	1906	1907	Yes		(?)	do	do	1911	Negative	1913	Weakly positive.				2
ATD	25	M.	Left elbow, left foot, both knees.	1909	1910	Yes		4 years	do	Pustular torpid.	1911	do	1913	Negative	1911	Positive		2
VMC	42	M.	Face, left leg	1908	1909	Yes		27 years	Oct. 15	Papular	1911	Positive.	1913	Doubtful				2
TN	18	F.	Left ankle	1911	(?)	Yes		(?)	do	Negative			1913	Positive			Feb. 17, 1913	[1] 3
JTD	21	M.	Nose, throat, face Right foot and leg Left shoulder	1898 1898 1908	1908 1911 1910	Yes		3 years	Oct. 14	do	1911	Positive.	1913	do	1911	Positive		2
MCN	35	F.	Left leg and ankle	1905	1908	Yes		(?)	do	Papular	1911	do	1913	Weakly positive.				2
JMC	34	M.	Right leg	1903	1905	Yes		Child	Oct. 15	do			1913	do				
MCC	36	F.	Soft palate perforated, nose.	1900	1901	Yes		do	do	do			1913	Positive				
BTT	19	M.	Nose, throat, left forearm. Left leg	1908 1900	1910 1911	Yes		(?)	Oct. 14	do	1911	Positive.	1913	do			[2] Feb. —, 1913	2
FAM	22	F.	Nose, throat, shoulders. Chest, thighs, knees, feet.	1893 1900	1900 1912	Yes		(?)	do	do	1911	Negative	1913	Negative				2
ATL	45	F.	Nose, throat, lips	1882	1883	Yes		(?)	do	Negative	1911	Weakly positive.	1913	do				2
VAN	28	F.	Left chest, buttocks Left foot and leg	1908 1908	1909 1910	Yes		25 years	do	Papular	1911	Negative	1913	do				2
MQT	38	F.	Nose, lip, palate, cheek.	1911	1911	Yes		9 years	do	Pustular			1913	Doubtful			Aug. 15, 1912 Oct. 17, 1912	[1] 6
MDL	40	M.	Arms, legs, feet, face, eyes, eyelids.	(?)	1910	Yes		(?)	Oct. 17	do	1911	Positive.	1913	Positive				2
MCC	45	F.	Nose, throat, lips, forehead.	1895	1910	Yes		18 years	Oct. 18	Papular			1913	do				2
JTT	23	M.	Both knees	1910	1910	Yes		(?)	Oct. 14	Negative			1913	do				2
FCC	57	M.	Right leg	1910	No.		No.		Oct. 22	Pustular			1913	Doubtful				
EST	22	F.	Left leg	1909	1910	Yes		7 years	Oct. 10	Negative	1911	Positive.	1913	Weakly positive.				2
JSC	54	F.	Nose, throat, lips, right and left foot.	1906	1908		No.		do	do	1911	Negative	1913	Negative				2
MDV	55	F.	Nose, throat, left arm, left wrist.	1882	1900		No.		do	Papular	1911	do	1913	Doubtful				2
APB	32	M.	Nose and throat	1895	1910	Yes		(?)	Oct. 20	do	1911	do	1913	Weakly positive.				2
MM	45	F.	Both shins	1878	1879		No.		Oct. 19	do			1913	do				2
CCT	20	F.	Right wrist, left nostril.	1911	1912	Yes		(?)	do	do			1913	do				
ACL	2f	F.	Nose, palate, pharynx.	1898	1900	Yes		(?)	Oct. 11	Pustular			1913	Positive				2
AQQ	49	F.	Feet	1962	1905	Yes		3 years	Oct. 13	Negative	1911	Negative	1913	Doubtful				2

[1] Months.

[2] Two injections.

Table A—Continued.

Initials.	Age.	Sex.	Gangosa lesions. Location.	Gangosa lesions. Began.	Gangosa lesions. Healed.	Yaws. Yes.	Yaws. No.	Yaws. Age.	Evidences of syphilis. Luetin. Date.	Luetin. Result.	Noguchi-Halton. Date.	Noguchi-Halton. Result.	Noguchi-Curtis. Date.	Noguchi-Curtis. Result.	Emery-Crow. Date.	Emery-Crow. Result.	Treatment anti-syphilis. "606."	Treatment anti-syphilis. Mixed treatment.
RMQ....	22	F.	Right wrist, right forearm, neck, forehead, septum perforated.	1907	1909	Yes.	....	18 years...	1913. Oct. 10	Papular...	1911	Positive.	1913	Positive...	......	....	....	*Yrs.* 2
SMQ.....	19	M.	Nasal septum gone, palate.	1898	1904	Yes.	....	3 years....	...do....	...do......	......	....	1913	Faintly positive.	......	....	....	......
DM......	47	F.	Right leg..........	1903	1910	......	No...	....	...do....	Pustular..	......	....	1913	...do......	......	....	....	......
MSG.....	25	F.	Nose, throat, left leg.	1890	1902	......	No...	....	...do....	Papular...	......	....	1913	Negative..	......	....	....	......
JDM.....	28	M.	Shins, right ankle..	1898	......	......	No...	....	Oct. 16	...do......	1911	Positive.	1913	Doubtful..	......	....	....	2
MDG.....	19	M.	Nose..............	1909	1909	......	No...	....	Oct. 20	Negative..	......	....	1913	Positive...	......	....	....	......
CBC.....	19	M.	Face, chin, legs..... Nose..............	1905 1912	1909 1912	Yes.	....	(?)........	Oct. 11	Papular...	1911	Positive.	1913	Weakly positive.	......	....	....	2
MDG....	18	F.	Nose..............	1907	1909	Yes.	....	(?)........	...do....	Pustular..	1911	Weakly positive.	1913	Negative..	......	....	Oct. 12, 1912	2
TMG....	27	M.	Nose, throat.......	1906	1913	Yes.	....	8 years....	Aug. 25	...do......	1911	Positive.	1913	Positive...	......	....	....	2
VMA....	22	M.	Nose, pharynx.....	1906	1909	Yes.	....	7 years....	Oct. 18	Papular...	1911	...do....	1913	...do......	......	....	....	2
BSS.....	19	F.	Left leg............	1911	1912	Yes.	....	(?)........	Oct. 13	...do......	1911	Negative	1913	...do......	1911	Positive...	....	2
MMR....	51	F.	Nose, lips, face, forehead.	1899	1899	Yes.	....	30 years...	Oct. 10	...do......	1911	...do....	1913	Negative..	......	....	....	2
CSS......	42	F.	Nose, throat....... Face, lips..........	1904 1905	1908 1909	Yes.	....	7 years....	Oct. 11	Negative..	1911	Weakly positive.	1913	Positive...	......	....	Oct. 12, 1912	2
ASQ.....	31	F.	Nose.............. Throat, left ear.....	1909 1904	1910 1905	.....	No...	....	...do....	Papular...	......	....	1913	Faintly positive.	......	....	....	2
JFB.....	60	F.	Throat............	1913	1913	Yes.	....	7 years....	Dec. 29	...do......	......	....	1914	...do......	......	....	....	1 6
PSND...	23	M.	Ulcer, left shin..... Pharyngitis.........	1912 1913	1913 1913	Yes.	....	8 years....	Oct. 13	Negative..	......	....	1913	Negative..	......	....	Feb. 14, 1913 Mar. 18, 1913	1 3
MSND...	19	F.	Right foot..........	1913	......	Yes.	....	1 year.....	July 13	Pustular..	......	....	1913	Faintly positive.	......	....	....	1 8

SCN	64	F.	Arms, legs, feet Both feet	1908 1912	1911 1912	Yes	....	(?)	Sept. 19	Negative	1911	Positive	1913	...do	......	....	....	2
ASA	30	M.	Left forearm Right foot	1913 1913	1913	Yes	....	6 years	Dec. 29	...do	......	....	1914	Weakly positive	......	....	Aug. 26, 1913 Sept. 16, 1913	....
VTM	32	M.	Left foot, ankle, toes.	1901 1912	1909 1913	Yes	....	5 years	...do	Pustular	......	....	1914	Positive	......	....	....	2½
RYP	33	M.	Throat and nose	1887	1888	(?)	....	(?)	July 7	Papular	......	....	1913	...do	......	....	....	2
JBB	60	M.	...do	1888	1889	(?)	....	(?)	...do	...do	......	....	1913	...do	......	....	....	2
ASNSN	39	M.	Right foot and leg Left foot and leg Nose and throat	1884 1884 1895	1894 1894 1895	Yes	....	2 years	Dec. 29	Pustular	......	....	1914	Faintly positive.	......	....	....	2
MSSN	11	M.	Nasal septum, left ear, right arm, right forearm, left arm, left thigh, left leg.	1906	1912	Yes	....	1 year	...do	Negative	......	....	1914	Negative	......	....	Oct. 31, 1913	1½

[1] Months.

TABLE B.—*Controls.*

Number and initials.	Sex.	Disease.	Luetin, date.	Curtis, result.	Noguchi, date.	Curtis, result.	Treatment.
			1913.		1913.		
1. A. H. B.	M.	Secondary syphilis	June 17	Negative	June 17	Positive	None.
2. T. F. M.	M.	Suspicious history of tertiary syphilis.	June 27	...do	June 27	Faintly positive.	Do.
3. J. E. C.	M.	.....do	July 30	...do	July 31	Positive	Mixed; mouth.
4. J. E. C.	M.	.....do	Sept. 12	Positive			"606," doses.
5. J. E. C.	M.	Secondary syphilis	Dec. 28	Negative	Dec. 28	Negative	"606," doses.
6. V. J. C.	M.	Suspicious history of secondary syphilis.	...do	...do	...do	...do	None.
7. N. M.	M.	Secondary syphilis	...do	...do	...do	Positive	"606," doses.[1]
8. M. K.	M.	Obscure history of tertiary syphilis.	Sept. 20	...do	Sept. 20	Negative	None.
9. Y. I.	M.	Suspicious history of tertiary syphilis.	...do	Positive	...do	...do	Do.
10. V. C. P.	M.	Tertiary syphilis	June 17	...do	June 17	Doubtful	Do.
11. C. A. M.	M.	Control	July 27	Negative	July 27	Negative	Do.
12. V. Y. P.	M.	.....do	Oct. 12	...do	Oct. 12	...do	Do.
13. A. M. C.	M.	.....do	Oct. 14	...do	Oct. 14	...do	Do.
14. R. Y. C.	M.	.....do	...do	...do	...do	...do	Do.
15. M. M.	M.	New yaws	Aug. 16	...do	Aug. 16	...do	Do.
16. M. A. V.	F.	.....do	Sept. 8	Positive	Sept. 8	...do	Do.
17. R. H. G.	M.	.....do	Sept. 12	Negative	Sept. 12	...do	Do.
18. V. T. C.	M.	Cleft palate, congenital	Oct. 13	...do	Oct. 13	...do	Do.

[1] Third test.

NOTE.—Nos. 1 to 8, inclusive, are white enlisted men; No. 9 is a Japanese; remaining numbers are Chamorros. Nos. 3, 4, and 5 are same individual.

UNRELIABILITY OF WASSERMANN TESTS USING UNHEATED SERUM.

By E. R. STITT, medical inspector, United States Navy, and G. F. CLARK, passed assistant surgeon, United States Navy.

For the past year in the laboratory of the United States Naval Medical School the reporting of positive complement fixation tests for syphilis has been based solely on the original Wassermann technique, and a check test with the Noguchi technique, employing inactivated serum instead of unheated serum.

Carried out in this manner these tests have invariably agreed when there was no anticomplementary action from bacterial contamination, which has occasionally occurred in sera sent from a distance. The Noguchi technique seems more sensitive to such anticomplementary influences as would be operative in a bacterial contamination of serum used for the test.

When using Noguchi technique with unheated serum, it was found that the results with it corresponded with those obtained with the Emery technique, where the fresh, complement-active serum of the patient was employed, but that both of these tests gave positive or suspicious reactions in cases where the original Wassermann or inactivated serum Noguchi tests showed negative findings.

It is our opinion that the quantitative feature of the Emery technique is of the greatest value, and we would recommend this technique

for the controlling of therapeutic results, once a positive diagnosis has been made with a technique which can, at any rate, be designated as conservative.

LABORATORY NOTE ON ANTIGENS.

By G. F. Clark, passed assistant surgeon, United States Navy.

Cholesterinized antigen has been used in comparison with acetone insoluble antigen in the last 130 Wassermann tests at the United States Naval Medical School with the following results:

Positive with cholesterinized antigen	51
Positive with acetone insoluble antigen	40
Negative with cholesterinized antigen	51
Negative with acetone insoluble antigen	85
Doubtful with cholesterinized antigen	28
Doubtful with acetone insoluble antigen	5

The anticomplementary, antigenic, and hemolytic properties of each antigen were investigated as carefully as possible. There has been marked variation in the inhibitory power of the cholesterinized antigen, so that it would seem that the power of fixation of complement depends, at least in part, upon an increase of anticomplementary power of any serum, either normal or syphilitic, as stated by Thiele and Embleton in The Lancet, April 11, 1914.

PREVENTION OF MOUTH INFECTION.[1]

By Joseph Head, M. D., D. D. S., of Philadelphia, Pa.

The great scientists of the medical world are agreed that mouth infection is the cause of numerous systemic diseases—pernicious anemia, endocarditis, rheumatism, arthritis deformans, ulcer of the stomach, and others too numerous to mention.

The fundamental means of preventing mouth infection is the mechanical removal of the masses of disease germs from the teeth and gums. When this has been done a mild antiseptic wash held in the mouth for a minute or two will be able to inhibit the growth of the remaining film until it is time to cleanse the mouth mechanically again. For germs of disease are dangerous, not only as germs; they are dangerous in direct proportion to their numbers and the length of time they are permitted to make their attack on the tissues. The immune bodies of normal blood can readily resist a few germs of disease for an indefinite time, but when the germs, being undisturbed, are allowed to grow indefinitely the resistance of the tissue cells is overthrown through a continued ever-increasing attack. Therefore,

[1] Presented at a joint Army and Navy conference, Feb. 3, 1914

it is evident that the fundamental remedy is to keep the ever-present disease germs reduced to a film so thin that the resistance of the blood in the tissues will always be able to withstand them, and also to keep the bacterial masses on the teeth so thin that not enough acid can be secreted to effect a softening of the enamel through which the germ may find an entrance to the interior of the tooth.

The three acknowledged means of removing and inhibiting the growth of the bacterial masses are: (1) floss silk; (2) the tooth brush; (3) the mild antiseptic wash. The scientific use of the floss silk is absolutely essential in the daily cleansing of the mouth. And yet its scientific use is not understood. It is, of course, useful in removing particles of food that may act as culture media for the growth of disease germs, but the greatest function of floss silk is to remove the mass of disease germs themselves, that day by day, week by week, month by month, will steadily collect in between the teeth. There is no other means than the floss silk for removing these masses from between the teeth that are in close apposition where the gum has slightly receded.

Dentistry has recommended movements of the toothbrush calculated to cleanse in between the teeth, which a single glance in the mouth immediately after the teeth have received such a brushing will show do not and can not cleanse in between the teeth. In teaching such misleading methods of tooth cleansing dentistry has been perpetuating the very conditions she professes to obviate. As before stated, the only instrument capable of cleansing the spaces between closely fitting teeth is the floss silk, and this should be swept over each approximating surface of the teeth at least once a day, and, better, twice a day. This will break up and remove the bacterial masses that collect year in and year out because the toothbrush erroneously is supposed to remove them. This is why tooth decay nine times out of ten starts in between the teeth. This is why pyorrhea alveolaris (Riggs's disease) or gum infection ninety-nine times out of a hundred starts in between the teeth almost as soon as the gum has receded sufficiently to make an interdental space. For the lack of proper use of the floss silk, undisturbed mouth infection starts between the ages of 5 and 10 to reveal eventually, at the age of 40 or 50, its insidious toll of general disease and death. Almost all, if not entirely all, of this can be remedied if at the age of 5 the child is taught the use of floss silk—the child is taught to cleanse in between the teeth, not for the sake of being clean, but for the sake of growing up strong and healthy. No child wants to be clean, it prefers to be dirty, but every child wishes to grow up strong and well. Look how they will labor and strive to improve their bodies for athletics! And if they are taught that the use of floss silk is just as necessary to a healthy adult life as arduous exer-

cise, there is no question that the floss silk will be used, and effectively used.

But let us consider the use of the toothbrush as a means of removing the bacterial masses from the exposed surfaces of the teeth and the gums. Just as those who never use floss silk, never cleanse in between the teeth, so do the great majority of those who brush the teeth never really cleanse them. The cleansing action of a toothbrush can only lie in bristle friction, and most well-meaning people either use strokes of the brush that never get beyond a pivoting of the long bristles, or they use brushes so large that there is neither room to move them nor to place them against the wisdom teeth. With all the talk there has been about tooth brushing since Adam delved and Eve spun, the wisdom teeth have never been brushed. The dirty, neglected wisdom teeth have been as badly treated as the near-sighted children of 50 years ago who were relegated to the dunce cap because they could not see the letters of the book they were blamed for not expounding. The wisdom tooth in structure is just as sound as any other tooth, and it has its bad name simply because it is never cleansed. And because the back molars are badly cleansed, that is the reason why they are usually the first to loosen from infection. Not only are they, as sources of infection, nearest to the tonsils, but they also have the greatest amount of infection for the tonsils to absorb.

The great test of a tooth-brushing method is, Does it cleanse where it is designed to cleanse? In plain words, the way to brush the teeth and gums is to brush them. Obviously, a too large brush is useless. To use a 2-inch brush with bristles a half inch long where there is only 2½ inches for free action means that there will be practically no bristle friction. And this is practically what occurs in most mouths during the process of tooth brushing. In the mouth the free space in any given line where a toothbrush can operate is seldom over 2½ inches. The toothbrush being ordinarily 2 inches long, generally reduces the movement of the brush to about half an inch, and this half inch is entirely taken up by the spring and pivoting of the half-inch bristles, so that with all the morning and evening attempts at tooth brushing there is very little bristle friction at all. Therefore, we should use a narrow three-row bristle toothbrush, not over 1¼ inches long, with bristles not over a quarter of an inch in length. This will allow sufficient room for a genuine motion of the brush in the mouth; and if the bristles are too stiff at first, the brush should be placed in hot water for a minute before using. Healthy gums can bear the same scrubbing as the finger nails and with the same benefit. In fact, unhealthy, inflamed gums when given a vigorous scrubbing with a stiff brush twice a day, in the course of a week or 10 days

will become firm and healthy, and no other treatment, to my knowledge, will accomplish the same results. This generally unknown fact was utilized some years ago by a certain charlatan who was trying to sell his tooth paste. He forced his way into my office and immediately began: "Doctor," he said, "this tooth paste is most useful for the cure of the small canker sores that so often come on the cheek and gums. All you have to do is to put a little of this paste on the toothbrush and brush it thoroughly into them." "But," I interposed, "won't the sores get well if they are brushed with the toothbrush and water?" "Why, yes," he replied, with a sickly smile, "but that is not usually known."

The brushing of the gums, as before stated, is of prime importance, but the intense pain occasioned by the first week's work is as severe as the pains in the back of an athlete when he first starts to get himself in condition. The trainer tells the athlete to go on with his work and that it will be all right, but the poor patient when he uses the brush vigorously is warned that he is injuring the gums, and he is only too glad to stop, being sure from his sore mouth that the advice is correct. I once showed a young lawyer how to brush his teeth and gums. He went away, and the next day I received a letter from him threatening me with suit for having ruined his face. Amusing as this incident is, it has a very serious bearing. The gums to be healthy must be scrubbed so as to remove the dead epithelial scale, which will act as food for the bacteria, and the bacterial masses must also be removed. This can not be done without causing an acute infection that will even at times cause a slight fever, and yet the gums will not heal and the bacteria can not be removed unless this severe ordeal is endured. I have felt that the severe reactions caused by brushing infected gums must at times be autoinoculation, not unlike the process of vaccination. For otherwise it seems incredible that day by day the gums should continue to be so sore and inflamed, and then between the seventh and tenth day suddenly get strong, hard, and firm, so they can stand any amount of brushing.

In a minor degree the same phase is noted when floss silk is first used on infected gums. The gum at first naturally bleeds and becomes infected from the use of a string that drives infection into it. This soreness has been used as an argument against the use of floss silk; but it is no just argument, as a few days' perseverance will invariably show. For the persevering scientific use of floss silk will, if the infection has not proceeded too far, be invariably followed by improvement, if not complete recovery of the infection between the teeth. If the patient was told that he must go through this week or 10 days of discomfort to avoid gout, rheumatism, valvular heart disease, and ulcer of the stomach, how readily and gladly would he do it, how cheap would he consider the price; but since he considers

it a question of mere cleanliness this ordeal is very naturally avoided, and the gout, rheumatism, valvular heart disease, and ulcer of the stomach, etc., all become possibilities, and, according to their percentages, certainties.

As before stated, the toothbrush should not be over an inch and a half long, the bristles not over a quarter of an inch long, and the handle long and large enough to afford a firm grip to the hand (fig. 1).

The bristles may be flat, as shown in the illustration; the principal thing to be avoided is too great bristle length, since bristle length, by increasing the pivoting arc of each bristle, just so much reduces the bristle friction produced by the general movement of the brush. And it is bristle friction alone that cleanses the teeth and gums during the process of brushing. Bristles one-half inch long will pivot three-eighths of an inch each way without bristle friction. If, therefore, there is a 1-inch stroke, the bristle friction stroke is only a quarter of an inch, and if, as frequently happens, the toothbrush stroke is only three-quarters of an inch, there is no bristle friction stroke at all. The quarter-inch bristle under the same conditions would have a play each way of three-sixteenths of an inch, which theoretically would cause only a three-eighths inch loss of bristle friction, but in reality it would be less, since the farther the bristle extends from the back of the brush, the more readily it bends under pressure. But granting that there was a three-eighths of an inch loss in bristle friction to each stroke, this would still leave a real cleaning friction when the 1½-inch brush was moved through a 2½-inch stroke, the amount of space for toothbrush motion usually found in the average adult mouth.

And so, having discussed the mechanics of general toothbrushing, let us proceed to inquire into the scientific method of toothbrushing as applied to the human mouth. There are three motions:

(1) The rotary motion whereby all the gums and teeth anterior to the second molars are cleansed with vigorous whirling action.

(2) The drawing motion wherein the middle of the brush is placed behind the wisdom teeth and drawn vigorously outward with a sweep across the buccal gum margins of the teeth.

(3) The drawing motion wherein the brush is placed back of the last moltar inside of the mouth and drawn sharply forward along the gum margin and the teeth.

In each stroke care should be used to follow the curve of the arch with the entire face of the brush.

Let us now discuss motion No. 1 in its minute relations:

The upper and lower front teeth should be placed edge on edge to avoid the lapping of the upper teeth over the lower. The toothbrush should then be placed against the teeth and rubbed upward to the

juncture of the upper gum and lip, forward for a distance of a fi-
inch or more, downward to the lower gums and lip margin, and the
back to the original position. This should be done at least five
six times as is shown in figures 2 and 3.

The brush should then be placed between the cheek and teeth
the right side. Here the same motions should be carried out. T
brush should be rubbed upward to the juncture of the cheek
gum, back to where the end of the brush is stopped by the overha-
ing curve of the lower jaw, down to the juncture of the cheek
lower gum, then back to the start, when it is repeated five or six ti-
(See figs. 4 and 5.)

This same motion should be repeated on the left side, and the t
movements of motion No. 1 are finished. After this movement
been thoroughly performed, if the second and third molars, upp
and lower, are examined they will still be found to be covered w
bacterial masses. And the reason for their undisturbed deposi-
easily discovered. The curving side of the lower jaw lies so cl-
to the upper teeth that no toothbrush can possibly get at them wh
the jaws are closed, and in the same way the last two lower teeth
excluded from the action of the brush by the fact that they lie be-
and within the curving angle of the lower jaw. When the jaws a
closed there is not an eighth of an inch room for toothbrush clean-
but when the jaws are partly opened the lower jaw swings ba
leaving a space of a full half inch in which the toothbrush can th-
oughly do its work, starting behind the third molars. Therefo
as just intimated, with motion No. 2 for the upper teeth, the mo
should be about half open and the lips and cheek held relaxed. Th
middle of the bristles of the $1\frac{1}{4}$-inch brush should be placed at th
back of the third molar and drawn briskly forward along the gu
margins, care being taken to follow the curve of the gum with th
entire face of the brush. (See figs. 6 and 7.)

To place the brush back of the third molar the relaxed corner o
the mouth should be stretched back by the back of the brush unt
the middle of the brush is directly back of the wisdom tooth. Whe
this is done correctly the brush will be pointing directly at the wis-
dom tooth on the other side of the arch. The middle of the brush
should be placed back of the third molar, not shoved in place by the
point, as by shoving it the bristles will be so bent that the resulting
pivoting of the bristles will cause the back of the upper third molar
to get no bristle friction at all, and so the back of the third molars
will not be cleansed.

Motion No. 2 in its action on the lower molar teeth is exactly the
same as with the upper, except that instead of placing the bristles on
the back of the lower third molar, the bristles are directed downward
on the gum neck of the third molar, and then with a sweeping, curv-

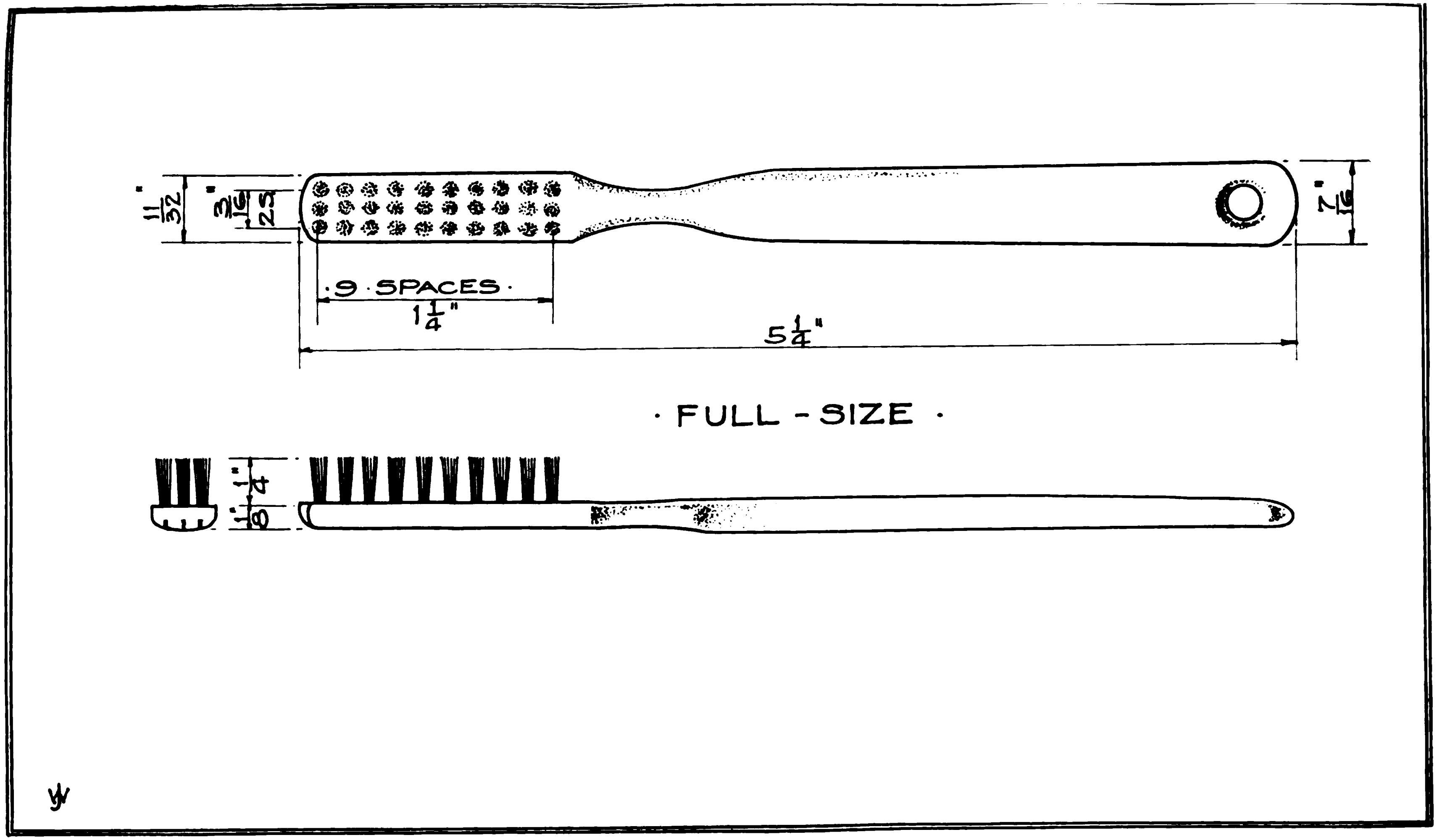

FIG. 1.—TOOTHBRUSH.

FIG. 2

FIG. 4.

FIG. 5.

FIG. 6.

FIG. 7.

FIG. 8.

FIG. 9.

FIG. 10.

FIG. 11.

ing downward stroke are brought sharply along the gum and cheek margin and the necks of the lower teeth. (See figs. 8 and 9.)

This motion should be done in the upper and lower jaw, right and left, not less than five or six times each.

Motion No. 3 is comparatively simple. The brush is placed on the gum and tooth line behind the third molars and drawn sharply forward over the insides of the central incisors, care being taken to follow the curve of the arch with the entire face of the brush. The brush should be placed back of the last molars, not thrust back of them, as thrusting will cause a bending of the brush bristles and result in a pivoting that again will leave the back molars without bristle friction, and consequently dirty. (See figs. 10 and 11.)

Motion No. 3 should be done five times on the upper and lower jaw, right and left; and when this has been done properly the teeth and gums will be free from bacterial masses, at least as free as the toothbrush can make them; and properly used the toothbrush is one of the most effective instruments for cleansing the mouth. Improperly used, or used as it is used ordinarily, tooth brushing is a delusion.

Having now discussed the mechanics involved in mechanical mouth cleansing, which must always be held as the chief defense against mouth infection, let us discuss the question of mouth antiseptics that unquestionably have value, although no feasible mouth wash yet discovered has the power of actually sterilizing the oral cavity. Bichloride of mercury 1:1000, held in the mouth, does show surprising germicidal power, but the chance of a mouthful being swallowed, in addition to its disagreeable taste, renders it impracticable as well as dangerous. Still, the old principle yet held by many scientific men that any disinfectant sufficiently strong to destroy the germs would also destroy the living tissue, must give way before clinical experience and our newer scientific knowledge. A solution of peroxide of hydrogen 1:100, held in the mouth for one minute, has been known clinically to cause inflamed gums to heal apparently much more rapidly than when it was not used. Heretofore, many have claimed that it acted not as an antiseptic, being diluted too rapidly by the mouth fluids to be effective, but it simply helped by washing away the viscid gum deposits and epithelial masses which would act as bacterial food. It was claimed that alkaline warm water would accomplish the same result.

No judicious observer would discredit the value of rinsing the mouth free from bacterial food, but it was nevertheless noted that some preparations of low germicidal power did cause a rapid healing of infected areas, where mouth washes of far greater strength would almost completely fail. Take, for instance, a great number of the mouth washes high in alcohol, of unquestioned germicidal power in the test tube, that have proved clinically of little value in arresting

gum infection, while the one-half per cent aqueous solution of sodium silicofluoride is a most efficient aid against infection in the mouth, while out of the mouth, in the test tube, it apparently will not kill a single germ. Here was supposedly an irreconcilable difference between clinical experience and laboratory research. But, fortunately, the wonderful researches of Ehrlich[1] concerning the germicidal action of salvarsan has thrown considerable light on this most important subject.

Ehrlich found that syphilis germs exposed to the action of salvarsan were neither destroyed or rendered in any way different as regards appearance or activity, but that they were nevertheless sensitized so that the white corpuscles of the blood could eat them in a way impossible to syphilis germs that had not been acted upon by salvarsan. He then evoked the principle that germs might be sensitized by a comparatively inert drug so that the bacterial action of the tissues of the blood might digest them. And this throws much light on the question of mouth antiseptics and justifies the clinical use of mouth washes that in themselves have no germicidal power.

As just stated, the two effective mouth washes are peroxide of hydrogen and a saturated solution of sodium silicofluoride. The sodium silicofluoride wash is beyond question the most effective wash in reducing gum infection around the teeth. Ninety-nine times out of a hundred this wash will almost entirely reduce the formation of tartar and at the same time heal the gums. In 1 per cent of the cases it causes the gums to heal but also makes a calcareous brown precipitate on the teeth, the reason for which has not been explained. It is extremely cheap to use, as a pound of sodium silicofluoride costing 75 cents, will make over 20 gallons of wash. Ordinarily its value in the reduction of tartar can not be overestimated.

When we come to the use of peroxide of hydrogen as a mouth antiseptic we open a large field where ignorant or unscrupulous commercialism has made the most preposterous claims, but where there is also a very considerable amount of therapeutic value, if it is used in sufficient quantity for a sufficient length of time. According to Paul Bert and Reynard, it was found that all fermentation caused by bacteria was at once stopped by peroxide of hydrogen, while no effect was produced on the enzymes or physiological ferments, such as are found in the stomach or pancreas, so that these tests would indicate that peroxide of hydrogen would have no harmful effect on digestion and yet would restrain the interfering action of microorganisms. It is, however, doubtful if a solution of peroxide weak enough to be held in the mouth for any practical length of time can act in any way but as an antiseptic, not a germicide. This is particularly interesting in reference to certain oxygen-liberating

[1] Lancet, Aug. 16, 1913.

dentifrices which claim to sterilize the mouth by the development of hydrogen peroxide. Most of these powders are antiseptically inert. However, they need not be inert if they are scientifically compounded. For instance, 10 grains of tooth powder of the usual commercial oxygen-liberating dentifrice usually yields only enough free oxygen to make 3 to 9 drops of a 1 per cent peroxide of hydrogen solution, and as 5 to 10 grains of powder is the amount of dentifrice sprinkled over a toothbrush, this 3 to 9 drops of 1 per cent peroxide of hydrogen is the full amount of antiseptic available in any one toothbrushing with the ordinary tooth powder. This, of course, is ridiculously insufficient. If, however, a tooth powder is made of—

60 parts peroxide of magnesium, No. 200-mesh sieve,
30 parts perborate of soda,
10 parts soap and flavoring,

we have a dentifrice theoretically containing enough free oxygen to make in an acid mouth 120 to 130 minims of fresh 1 per cent peroxide of hydrogen, and while this amount of antiseptic may not be developed, there is certainly enough developed to give excellent clinical results.

After the floss silk has been used, as previously described, the teeth should be well brushed with this preparation, and after the brushing is completed the saliva and dentifrice should be freely swashed in between the teeth for a period of two minutes, when it may be spat out. The mouth should not be rinsed with water after the brushing, as the particles of magnesia, being soluble only in acid media, will collect in between the teeth and act as a guard against the formation of acid, which, if it forms, will be immediately neutralized by the soluble magnesium salt which is thus automatically set free. The perborate of sodium used in this dentifrice is a bland salt that can be freely placed in the mouth without caustic action and in the presence of acid will develop 19 to 20 per cent peroxide of hydrogen. Most of the chalk tooth powders have a serious destructive erosive action on the teeth, and where this is found to have been the case perborate of soda, with suitable flavoring, will in itself make an admirable dentifrice and mouth wash, since repeated tests with a toothbrush, perborate of soda, and saliva on a natural tooth show that this preparation is nonerosive.

A 1 per cent peroxide solution neutralized of its free acid by a little soda also makes an admirable mouth wash with which the teeth may be brushed and the mouth and throat should be gargled after the process of mechanical cleansing is over. But the wash should be held in the mouth for at least two minutes, a shorter time being of questionable value.

There are a large number of washes and preparations generally recommended, some of which no doubt are of value; but these two

antiseptics have been singled out for the reasons given and because they have proved of special value to many patients in the daily routine of their mouth cleansing.

After so much minute explanation it may not be inadvisable to review once more just what the daily cleansing of the mouth should be. The surfaces in between the teeth should be swept on both sides by floss silk to remove all food and bacterial deposits. The teeth and gums should then be thoroughly brushed, as described, with the dentifrice or antiseptic mouth wash, and the saliva and mouth wash vigorously swashed in between the teeth for a period of not less than two minutes, so that the thin coating of bacterial film left by the floss silk on the sides of the teeth may be discouraged from growth until the next cleansing. Where there is marked gum infection the saturated solution of sodium silicofluoride should be held in the mouth for full two minutes after the procedure just described. This cleansing should be carried out morning and evening.

There is one other point that might with benefit be mentioned. Toothaches from inflamed nerves within teeth, sometimes apparently sound, are so reflected from tooth to tooth that the patient and even the dentist is sometimes at a loss to know the offending member. On account of this difficulty of diagnosis many useful teeth have been extracted without giving the desired relief. This is especially true of Army and Navy men situated at distant posts where the most favorable apparatus for diagnosis may not always be available. If a simple test were available which would pick out infallibly the tooth containing the nerve or pulp primarily causing the toothache or neuralgia, even if the condition were such that the pulp might not be removed and the toothache so cured, it would be at least possible to extract the right tooth. Where the toothache arises from a dead or almost dead nerve and the infection has been driven through the tip of the root into the gum, causing an acute gum inflammation and swelling, the diagnosis by biting or knocking on the tooth is simple in the extreme, and dentist and patient have no difficulty in finding the offending tooth. But where the pulp or nerve of a tooth has become infected, and the blood pressure is compressing the nerve filaments of the pulp under most agonizing conditions, the pain reflects into almost every tooth on that side of the face. If, however, a uniform heat can be applied locally to each tooth in succession for a second or two, as may be necessary to obtain the general response, when the offending tooth is reached the reaction is immediate—the toothache either starts at once or is greatly increased, and the cause or causes of neuralgia become at once clear, and are so capable of being treated or removed.

The instrument for such diagnosis is a small electric cautery that is heated just hot enough to char paper. The current always main-

tains a constant heat so that the stimulation will always be the same. When this is touched to the necks of the various teeth, one after the other, if the stimulation causes pain for less than a second the pulp is probably normal; if the pain lasts for 2 or 3 seconds the pulp is irritated and perhaps slightly infected, but if the pain lasts over 3 seconds or increases until the whole side of the face is involved in a spasm of pain, the only cure is to remove the nerve or remove the tooth. Where there is no reaction at all in a tooth and normal reaction in other parts of the mouth it indicates a probable reduction in the vitality of the pulp or its death. This should be investigated and if found infected the pulp should be removed and the canals properly filled, but it must not be forgotten that some people normally have teeth that are insensitive to heat, and in these cases, where there is a general lack of response, great caution and conservatism should be used.

The sure diagnostic sign is unusual response to stimulation of a tooth among its fellows, followed by severe and prolonged pain.

THE MEDICAL DEPARTMENT AT GENERAL QUARTERS AND PREPARATIONS FOR BATTLE.

By A. FAHRENHOLT, surgeon, United States Navy.

As a man-of-war exists primarily for the purpose of fighting, the surgeon's chief duties may be fairly stated to comprise: (1) Keeping the health of the personnel up to the highest state of efficiency before action, and (2) arranging for the care of the wounded in, and more particularly immediately after, action. It therefore follows that by far the most important drill on shipboard in which the medical officer is concerned is that of general quarters.

With the advent of the new Navy there grew up the idea, fundamentally wrong, that the surgeon and his assistants should be about the decks during action, detecting and dressing the wounded, and extending these functions even to such inaccessible positions as turrets, casemates, "soft ends," and gun rooms, and in spite of closed hatches, doors, and incidental battle obstructions. This is in sharp contradistinction to a conception of the old-time surgeon at work in the cockpit, safely below the water line, assisted by his mates and the chaplain. Smollett and Marryat well describe such scenes, which were the rule for many years before, during, and after the Napoleonic wars. Modern battle conditions demand the same safety for personnel and material as obtained in past times, with the addition of thorough instruction for all hands in first-aid work, the intelligent use of ambulance parties, and the establishment of certain relief stations.

The present intention of the bureau in the matter of relief for the wounded on shipboard after battle may be briefly described as follows:

1. Each fleet, division, or single ship is to be followed by a sufficient number of medical transports, i. e., ambulance ships, which carry medical officers, hospital corpsmen, material, small boats, etc.

2. After action each medical transport places on board a designated ship, or ships, a professional staff of fresh trained men who, replacing or supplementing the ship's medical officers, transfer to the ambulance ship those wounded who are able to be moved at once, and operate upon and dress those immediately in need of such attention. The ship will thus be cleared of wounded and useless men at the earliest possible moment, all the injured being regarded as transportable cases.

3. New men will be placed on board to take the places of those removed and the ship be ready again for action, possibly within a few hours.

While the great advantages of this plan are self evident, and while the plan itself will without doubt be put into operation on the breaking out of war, it is nevertheless absolutely necessary that each ship should have a carefully worked out and exercised scheme whereby these problems may be solved without outside aid. This would become necessary if for any of a variety of reasons the medical transport vessels failed to put in an appearance. In such a contingency it would be impossible to add to or replace the members of the medical department during or immediately after action, at the time when their services would be most urgently needed. It therefore becomes advisable to protect and shelter them as far as can be done from accidental injury, and they should remain, during actual firing, with a working proportion of the especially trained hospital corpsmen, behind armor, below the protective deck, if possible, or in the space selected as the battle collecting or dressing station. Custom and present regulations unite in requiring the establishment of both "relief" and "dressing" stations, manned by at least a portion of the commissioned personnel and Hospital Corps, and situated in advantageous positions about the fighting decks. It is unquestionably unwise to make such stations of considerable size and possibly also unwise to employ them at all. We may tabulate the disadvantages of this arrangement as follows:

1. It exposes a large portion of the skilled personnel to irreparable injury.

2. A majority of the wounded are more completely shielded at the station in which they are wounded than at any position to which they could be removed until action is over or a temporary lull occurs.

3. In the modern man-of-war little if any intercommunication is possible while actual fighting is going on.

4. In ships not fitted with dressing stations the locations chosen are usually not conducive to more than elementary surgical work by reason of their imperfect and noisy surroundings.

The primary objects of our efforts for the relief of the injured are (1) so to treat them that they will return to duty at the earliest possible moment, (2) to relieve suffering and save life, (3) to instill confidence in the ship's company that wounded men will be properly cared for. To jeopardize the lives of the few men on board who have the ability to accomplish these objects is not sound reasoning.

While the structural differences of the various classes of vessels in our service make it impossible to formulate hard and fast rules which would be uniformly suitable for battle preparations, the general plan of action at present should follow these lines:

1. Practical instruction of the entire fighting force in ordinary first-aid principles and placing ample supplies of dressings in isolated positions.

2. Protection of material by storage in one or two safe storerooms, preferably below the protective deck.

3. Establishment of at least one relief station for assembling and dressing of wounded, these to be returned to duty or sent during lulls in the firing and when hatches are open to more protected collecting or dressing stations.

4. Holding in reserve at least one medical officer, preferably all, and at least a majority of the trained Hospital Corps.

5. Establishment of a temporary collecting or dressing station for wounded, using the greatest security obtainable after hatches are open.

6. Organizing, instructing, equipping, and stationing an ambulance party.

7. Selecting, equipping, and using after battle such location as is found to be most suitable for operative work.

1. Could the impossible be accomplished, effort would be directed toward immediately detecting, dressing, and removing to a place of absolute safety each man as soon as wounded. This, however, is acknowledged by all to be impossible in the conditions existing during a modern sea fight. Stokes sums up the situation as follows:

> Very little methodical handling of the wounded will be possible; for the most part the comrades of the fallen man will pull him to one side, where he will lie until after the battle; prompt removal is not imperative, not even of moment.

The activities of the personnel may therefore be characterized as passively expectant during action and strenuously active after the firing has ceased. Stokes also says:

> (1) Extensive first aid is impossible and undesirable.
> (2) Multiple relief stations afford all the assistance possible.
> (3) Most first aid will be impromptu.
> (4) No organization for transportation is possible or desirable.

This possible temporary abandonment of the wounded is neither as cruel as it might appear nor does it act in most cases against the best interests of the man himself. We have seen that it is unwise to jeopardize the lives of those whose skilled services will be so urgently needed after battle. We must also realize that (1) it will be impossible, in view of fighting efficiency, to open doors of gun rooms, citadel, turrets, or hatches through protective or other decks on account of the necessary protection they offer against projectiles, and in some situations the air pressure certain spaces require. (2) Débris and obstructions incident to battle conditions will render intercommunication always difficult and at times impossible. (3) Could it be possible easily to leave gun stations some men might avail themselves of slight injuries to absent themselves from their necessary duties without sufficient cause. (4) Unlike the soldier, the sailor faces no possibility of being abandoned or trampled upon by movements of bodies of men, horses, or guns. (5) The protection afforded by the usual gun position is very strong and the air and ventilation usually good; these conditions may not be bettered by removal. (6) The time actually under fire during modern engagements will probably be short; the entire action may last a day or longer, but there will be, necessarily, many lulls or periods of inaction during which doors and hatches will be opened and ambulance functions carried out. (7) Many wounded by gun fire or splinters exhibit a merciful insensibility, and such wounds as a rule are not followed by profuse hemorrhage.

These facts being granted the importance of practical instruction for the isolated fighting units becomes manifest. Unquestionably this instruction is one of the most important of the surgeon's duties and upon its thoroughness and practicability may depend the ability of the ship to win. It is the keystone of the arch of medical preparedness. The instruction necessary for the Hospital Corps and the ambulance party is of a more advanced nature and should include perfection in laying bare and sealing wounds, the stopping of hemorrhage, the immobilization of fractures, the treatment of cases of asphyxiation following the inhalation of irrespirable gases, the transportation of wounded, advice in working in the excitement and noise incident to action, and in the trying times to be expected after action.

2. If the ship is not provided with a medical storeroom situated below the protective deck in a relatively safe place, one should be borrowed and used for the safeguarding of such material as will be urgently needed after action. For the maximum of safety probably no space above the water line can be depended upon, and a division of such material between two or three storerooms would lessen the chances of damage or loss. Stores placed below should include almost

all instruments and dressings and outfits for use after battle, such as bedding, spare stretchers, operating table, etc.

3. Relief stations may be established at suitable locations near the fighting positions. They should be manned by the ambulance party, if thoroughly reliable; if not, one or two hospital corpsmen may be detailed with them. At these locations of comparative safety all the wounded who come to the notice of the ambulance party will be returned to duty, if possible, or assembled awaiting transportation to collecting station or to post battle operating rooms. Here they are dressed, tagged, and made as comfortable as possible.

4. Should but two medical officers be attached to a ship, it would be wise for them to remain, with a majority of the hospital corpsmen, in security below decks while the actual fighting is going on, and to emerge during an interval or lull in the fighting to attend to the wounded. It is imperative, however, that one doctor and half the hospital corpsmen remain below.

5. The surgeon should, if it can be done, provide for the establishment of a temporary collecting or dressing station for the wounded, to be used after hatches are opened during battle intervals, to give them the greatest security available should action be resumed. This space must afford (1) security, (2) reasonably good ventilation, (3) water, (4) a fair temperature, and (5) freedom from interference with the movements of men or ammunition. In some vessels no such space can be be found, i. e., wash rooms, laundry spaces, or alcoves, which are sometimes used, may be found to be too hot, too inaccessible, etc.; also after a short engagement, in which there was no probability of renewal of action, such space would be useless, as the post battle operating room would be immediately set up.

6. The importance of the "ambulance party" has largely disappeared since the advent of the all-big-gun. In predreadnaught and open-gun-deck types an ambulance party comprised of 3 per cent, 5 per cent, or even more of the personnel was considered of importance. This number would hardly be necessary in the type of turret ship recently built and now building. In these later vessels structural peculiarities render isolation very complete, and ambulance functions in action practically impossible. This duty will, however, form our first of the many activities which will begin just at the close of battle. To require 5 per cent, i. e., 50 men in a crew of 1,000, to be held for this duty alone would not be advisable. Members of the gun crews themselves will be available and willing to aid the representatives of the Medical Department in bringing the injured to designated points. In this way an ambulance party of 20 to 25 men, each carrying a wire stretcher, could, immediately at the close of action, report at the various prearranged turrets, gun positions, and other points and, with the aid of the injured men's

own mates, get them out of inaccessible positions or wherever they might be, and carry them to the surgeon.

This party of men should be held in reserve in one or more sheltered positions and might be in the charge of a hospital corpsman or any other suitable leading man. Their duties would be primarily (1) to search for wounded, (2) to see that first-aid principles have been carried out sufficiently for transportation, and (3) transportation. When they receive the wounded, they should be ready for removal, it being expected and assumed that the gun crews have applied practical first aid. This small number of men, 2 to 2½ per cent, should be regularly assigned for this duty on the station books and should be turned over to the surgeon absolutely without other claims for the entire time of each and every general-quarters period. It makes no difference what rate they ordinarily hold, but it is of importance that they should be suitable men and, a point of no less consequence, that there should be no possibility of other conflicting duties at this time to render their appearance uncertain. It would not be advisable to have this number of men enlisted for this duty alone. One member of the ambulance party should be instructed to keep in touch with a designated telephone instrument; messages of importance may thus be received through central stations from turrets, casemates, soft ends, bridge, engine or fire rooms, or from members of the medical department stationed below.

7. Provisions must be made for a space in which the surgeon may assemble, operate upon, and dress the wounded after the close of action, a post-battle operating room. It is assumed that the commanding officer will permit the temporary use of any space judged to be most suitable. If the deck on which the galley is situated is not obstructed by battle débris, a satisfactory location may be found near it; its water, coppers, steam connections, ovens, drains, fresh air, etc., make this location particularly desirable. The ward room also may be considered. Canvas screens and deck coverings will make an excellent room. When the ship's regular operating room is situated behind armor it may possibly serve its purpose at the end of an engagement. If, however, it is not so placed, its chance of surviving an action without injury is small. In either case the room should be placed in order, closed, and abandoned until after the firing has ceased. All dressings, tables, instruments, and equipment needed after action must be removed, as before stated, from exposed situations and placed in previously arranged suitable spaces, usually in storerooms.

In improvising an operating room care must be taken to equip it in a practical manner, remembering the needs to be expected at such a time. Light, including emergency oil lamps, ventilation, accessibility to water supply, and drainage must be remembered.

Equipment: Each member of the ambulance party and Hospital Corps should wear freshly washed white clothes and, for ease of identification, a regulation red cross brassard on the left arm. When on deck each member of the ambulance party or Hospital Corps should carry a dressing haversack containing a suitable assortment of first-aid dressings, shell-wound dressings, instant rubber tourniquets, bandages, fracture boards, and such other articles as may be considered necessary. They should be supplied with a pair of shears of good size, fastened by a lanyard, and some should carry canteens of water or coffee, or both. All wounds are to be sealed as soon as discovered. These men are not to be supplied with hypodermic outfits and must be carefully taught the use and abuse of the tourniquet. In order that a sufficient amount of sterile dressing material may be immediately available after action, a liberal supply should be sealed in tins (old coffee or bread tins have been satisfactorily used for this purpose) and stored in suitable protected places. Remember that the sterilizer may be destroyed, in which case it may be possible to improvise one by using a container and steam from some line below.

A reserve supply of dressings should be held for the ambulance party. Each gun in the ship should be furnished with a number of dressings sufficient to supply at least a small one for each member of the crew. These may be advantageously put up in easily opened tin boxes (sardine-can principle), practically an enlarged first-aid packet. Two sizes could be improvised or issued for use at larger or smaller guns. They should be suitably painted, supplied with slings or hooks, and should be hung up near each gun, not thrown on the deck. Turrets, casemates, gun rooms, soft ends, and other isolated positions should have ample dressings so supplied and constantly available. These packages or tins should be kept more or less permanently in place, certainly at such times as at sea during hostilities, during target practice, and at inspections, thus saving a large amount of work in breaking out and placing this considerable number of packets after the call for general quarters sounds.

The stretchers used should be the ones now issued—Stokes's wire-splint stretcher—20 to 25 in number; each should be equipped with straps and have a line about 10 feet long—a hammock lashing will serve—attached to the head end to facilitate passing and sliding them through hatches and down ladders. Many of these stretchers should be permanently kept in certain places about the decks, definitely decided upon by the executive officer and surgeon. The locations chosen should be inconspicuous and such as not to interfere with the ship's regular work. They might be placed against bulkheads or stowed above like carling tables or boxes, properly secured. Some should correspond to the previously determined stations of the ambulance parties. The placing of these stretchers in regularly as-

signed locations about the ship would save the Medical Department much needed stowing space, would reduce materially the time and work required to report the surgeon's division, and would permit the rapid handling of patients at all times, such as accidents during coaling ship, handling of stores, etc.

The dead encountered by the ambulance party should be removed from the sight of the surviving personnel and placed, if possible, in near-by rooms or spaces. If, while fighting is going on, the number of dead becomes exceptionally large it will become necessary and entirely proper to throw the bodies overboard. Care must be taken to insure an unequivocal proof of death in cases so disposed of. Data must be carefully kept to enable the Pension Commissioner to adjust his records.

The equipment necessary at relief stations must be simple and preparations made chiefly to stop hemorrhage, dress burns, to perform other imperatively demanded interference, and to pass on the efficiency of previously applied dressings. Tincture of iodine will be found to be more useful in many instances than the more bulky antiseptic solutions; adhesive straps may save time; fracture boards are to be kept on hand, also dressings for burns and supplies of drinking water. These stations endeavor to return to duty as large a percentage of the wounded as possible. The more seriously injured are assembled there for short periods of time. A well instructed hospital corpsman should have charge of such stations unless the ship possesses three medical officers. Their locations must depend upon the structural peculiarities of the class of ship and the opinion of the senior medical officer. These stations, as well as the locations chosen by the surgeon, must be capable of removal to other situations on short notice as the exigencies of battle may require.

The collecting or dressing station, if established, is simply an amplified and more secure relief station, one at which a medical officer presides but which can only be accessible during a lull in firing and when hatches and doors are opened. A little more extensive work may be done there, but still only what is urgently necessary. Therefore an ample supply of dressings for all injuries or burns, sufficient instruments, infusion apparatus, tincture of iodine, local anesthetics, table, trays, gloves, gowns, etc., must be prepared.

The equipment necessary for the post battle operating room will be probably not elegant, perhaps even crude, but it must be practical and capable of good work and the rapid handling of a large number of variously wounded men. As all the resources possessed by the Medical Department are available at this time, we must break out and set up in this improvised surgery any equipment the senior surgeon deems advisable. This must be quite extensive, in accordance with a previously worked out list, and transported and in-

stalled by previously designated hospital corpsmen. The amount of work done here after action may, and probably will, be immense; it may easily be the greatest and most trying duty in the entire career of the surgeon, and all his powers of resourcefulness, physical strength, and professional ability will be taxed to the utmost.

Assuming the integrity of the Hospital Corps, the senior medical officer should proceed to his operative work and the general care of his many patients with the assistance of a routine previously worked out. It is well to have men assigned to the following duties: (1) Assembling and judging the order of precedence of the wounded, preparing for examination, and table; (2) sterilization of instruments; (3) iodine swab and local work; (4) anesthetics, local and general (spinal, etc., by surgeon); (5) assistant; (6) pass dressings; (7) after treatment; (8) clinical clerk. This latter man, who may be a yeoman, takes down such data as the surgeon may indicate—name, wound condition, work done, etc.; outline charts would help in locating and describing injuries. Nursing watches should be established and a treatment book started. Preparations for administration of saline solutions and treatment of shock must be available.

It is of importance to be able to obtain from the Commissary Department, as soon after the close of action as possible, nourishment suitable for the various cases on hand, remembering the value of liquid food and food stimulants after shock has passed off.

The few bunks available in the sick bay, C. P. O. quarters, etc., even if spared by gunfire, could accommodate a very small part of the possibly 100 or more severe bed cases. It may be expected that few of this number will be able to endure the curved position necessitated by a hammock as ordinarily swung from the hooks. To place the hammock and mattress on the deck would be very uncomfortable for many cases if such positions were prolonged for several days. It is probable, however, that the greater proportion of the wounded would necessarily be so placed. The surgeon might, if compelled to retain the wounded on board for some days, be able to improvise cots, using spreaders or wood if available, or he might, by utilizing bag jack stays and lines, stretch more or less flat a number of hammocks and thus provide a group of comfortable beds. The advantages offered by each individual ship or class must be utilized by the ingenuity of the surgeon. In removing wounded from a ship it will be found to be safer and more expeditious to place them in boats, if there are any, while still in their cradles, and to hoist the boat itself with its cargo of injured directly overboard, rather than either to hoist out each case in stretcher or lashed in hammock or to carry stretchers or hammocks down accommodation ladders to

small boats. Six or eight recumbent patients may thus be evacuated at one time.

It must be assumed that in the present status of naval warfare the engineer's force will not be subject to injury from shell fire. The surgeon should, however, place in the engine room and fire rooms first-aid tins or bundles, dressings for use in case of burning accidents, and should familiarize himself with the best method of removing the injured from both of these spaces. He should also work out a plan for aiding and removing the injured from magazines, handling rooms, and all other places difficult of access.

The number of casualties to be expected after a sea action between modern vessels is influenced by a variety of conditions:

1. Structural characteristics—amount and distribution of armor, general protection of personnel, relative strength of vessels, power.

2. Personnel of both sides—skill, aggressiveness, endurance.

3. Kind of fighting—close or distant, whether men are kept behind armor or not (light guns), whether ship is in exposed position or not (head of column), victorious or otherwise.

4. Freedom from ship accidents (one-fourth of the recent Japanese injuries occurred independently of the guns of the enemy).

Many authorities, among them Suzuki and Pasquale, unite in agreeing that in a fight between two equal groups of modern vessels we may expect a loss of 20 per cent; individual ships are apt to suffer more severely, and that this will be divided about as follows:

	Per cent.
Mortally wounded	4
Seriously injured	[illegible]
Slightly injured	[illegible]
Total	20

Dr. M. zur Verth states that out of 100 Japanese injured, 12 died immediately, 6 died later, and 82 recovered. Taking these data as the probable distribution of a 20 per cent loss and examining the known casualties which have occurred on certain vessels recently in action, the following table may be constructed:

	Slight number of casualties.	Moderate loss.	Moderate loss.	Probable loss.	To be prepared for severe.	Ship possibly out of action.	Ship possibly out of action.	Ship probably out of action.	Greatest number of wounded.	Unable to continue action.	Unable to continue action.	Unable to continue action.	Theoretically all fighting force killed.
	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.	P. ct.
Percentage of loss	5.0	10.0	15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	55.0	60.0	[illegible]
Killed immediately	.7	1.4	2.0	2.5	3.5	5.0	7.0	10.0	14.5	20.0	25.0	40.0	[illegible]
Mortally wounded	.3	.6	1.0	1.5	2.5	3.0	3.5	4.0	4.5	5.0	6.0	9.0	[illegible]
Severely wounded	2.2	4.4	6.5	8.5	10.0	12.0	14.0	16.0	18.0	20.0	22.0	11.0	[illegible]
Slightly wounded	1.8	3.6	5.5	7.5	9.0	10.0	10.5	11.0	8.0	5.0	2.0	0.0	[illegible]

Given a vessel having a complement of 1,000 men the following casualties might be expected:

	Slight number of casualties.	Moderate loss.	Moderate loss.	Probable loss.	To be prepared for severe.	Ship possibly out of action.	Ship possibly out of action.	Ship probably out of action.	Greatest number of wounded.	Unable to continue action.	Unable to continue action.	Unable to continue action.	Theoretically all fighting force killed.
Killed	7	14	20	25	35	50	70	100	145	200	250	400	650
Mortally wounded	3	6	10	15	25	30	35	40	45	50	60	90	0
Severely wounded	22	44	65	85	100	120	140	160	180	200	220	110	0
Slightly wounded	18	36	55	75	90	100	105	100	80	50	20	0	0
Total loss	50	100	150	200	250	300	350	400	450	500	550	600	650
Total wounded	43	86	130	175	210	250	280	300	[1] 305	300	300	200	0
Total wounded to care for	25	50	75	100	125	150	175	200	225	[2] 250	[3] 280	200	0

[1] 45 per cent theoretical greatest number of wounded.
[2] 50 per cent theoretically the killed and mortally wounded equal the remainder of the wounded.
[3] 55 per cent theoretical greatest number requiring attention.

It is not supposed that a table of this kind can be regarded as more than approximately accurate in detail.

(1) Published battle statistics are frequently very misleading and often absolutely inaccurate.

(2) No two vessels leave the battle line having experienced the same conditions, either internal or external. It is possible that a 5 per cent loss may be caused by a few shells resulting in either many killed and relatively few wounded or vice versa. As the casualities increase, however, the percentages are apt to equalize themselves. It will be seen that as the casualties rise toward the higher figures the proportion of killed and mortally wounded to wounded is correspondingly increased. This may be shown by the table as follows:

Casualty percentage.	Killed and mortally wounded.	Remainder of wounded.	Ratio.
5	10	40	1 to 4
10	20	80	1 to 4
15	30	120	1 to 4
20	40	160	1 to 4
25	60	190	1 to 3.16
30	80	220	1 to 2.75
35	105	245	1 to 2.33
40	140	260	1 to 1.85
45	190	260	1 to 1.36
50	250	250	1 to 1.
55	310	240	1 to 0.77
60	490	111	1 to 0.02

Reported ratio of killed to wounded in some recent sea actions.

1. Russians, August 10 (losing side) ____ 1 to 4.61
2. Japanese vessels at Tsushima, Togo's report (victor) ____ 1 to 3.69
3. Battle of the Yalu, Chinese loss (losing side) ____ 1 to 2.44
4. Battle of the Yalu, Japanese loss (victors) ____ 1 to 2.26
5. Japanese flagship *Matsushima*, Yalu (victors) ____ 1 to 2.17
6. Chinese flagship *Ting Yuen*, Yalu (losing side) ____ 1 to 1.78

7. Russians, August 14 (losing side) .... 1 to 1.75
8. Russian ship *Rurick*, August 14 (losing side) .... 1 to 1.5
9. Spaniards, Manila Bay (losing side) .... 1 to 1.2
10. *Reina Cristina*, Manila Bay (losing side) .... 1 to 1.0

While 1 to 4 is regarded as probable up to a 20 per cent loss, beyond this figure the ratio becomes rapidly lowered. This is due, of course, to the subsequent killing of the wounded. We may assume about 65 per cent of the personnel of a modern armored vessel to be vulnerable to gun fire. The first injury received kills, mortally wounds, seriously wounds, and slightly wounds a certain number of people. The subsequent hits cause injury to this same group of people and, theoretically, slowly convert the slightly wounded into seriously wounded, these into mortally wounded, and finally bring death to all hands except, again theoretically, the 35 per cent on duty in more secure stations.

It is known, however, that the figures beyond a loss of 40 per cent are very problematical. A ship suffering such loss, or more, will in all probability be rendered unable to continue action, by reason of one or more of the following conditions: (1) loss of personnel, (2) injury to material, i. e., guns, engines, steering apparatus, communication, etc., (3) presence of poisonous gases and smoke, steam, fires, exhaustion of ammunition, leaks, etc.; and, later, (4) a general paralyzing of all functions, including, probably, those of the Medical Department.

In determining the amount of dressings and various medical and surgical stores which it is advisable for vessels anticipating action to carry, a fair but arbitrary amount must be allowed. While, on the one hand, a high personnel injury, the necessity of keeping the wounded on board for some days and the possibility of the presence of a number of the wounded of the enemy would make it advisable to have on hand a large amount of material, on the other, the loss might be a trivial one, and ambulance and transport ships be on hand to remove the injured who had required little more than first-aid attention. As we have reason to believe that 20 per cent is a fair average battle casualty percentage, why not assume 40 per cent and a period of seven days as a basis for stores, thus allowing a possible margin for the unexpected which in warfare is probably more to be considered than in peace time. If these premises are allowed we may attempt to determine the amount of needed stores as follows: Ship of 1,000 complement, 40 per cent loss, 400 casualties; 200 requiring necessary attention (one-half total casualties being killed and slightly wounded), divided into 40 mortally and 160 severely wounded. Many of the slightly wounded will require and receive dressings, but are not here included.

In looking over the supply table allowance for the largest vessels with this end in view, we are especially interested in but a small proportion of the several hundred items listed there. These necessities may be grouped as follows:

1. Anesthetics.
2. Instruments.
3. Antiseptics.
4. Ligatures.
5. Dressings.
6. Splint material.

1. Anesthetics: There are seventy-two 125-gm. tins of ether and twenty-four 200-gm. bottles of chloroform. This, without breakage, might possibly permit 100 anesthetics and would, quite likely, be an insufficient amount. For safety this should be increased about double, unless the medical officer is prepared to perform spinal anesthesia or other methods of obtaining general or local insensibility, in which case such material must be secured.

2. Instruments: The full allowance is ample. A few additional hemostatic forceps might, however, prove useful.

3. Antiseptics: The full allowance of:

$HgCl_2$	gms	2,000	make 2,000 gallons of 1–4000 solution.
Cresol	c. c	10,000	make 62.5 gallons of 4 per cent solution.
Phenol	c. c	4,800	make 24 gallons of 5 per cent solution.
Formaldehyde	c. c	5,000	make 12,500 gallons of 1–10000 solution.
Calx chlorinata	gms	21,000	make 52.5 gallons of 10 per cent solution.
Iodine	gms	100	make 1.428 c. c. of tincture.
Alcohol	c. c	24,000	make 6 gallons.
Teribinthum	c. c	4,000.	
Iodoform	gms	800.	

This amount is undoubtedly sufficient.

4. Ligatures: The total allowance of all nonmetallic ligatures is 126 tubes. This amount is probably not sufficient, but various kinds of thread are to be had in great quantities on shipboard and, when necessary, could be used. The Japanese found much trouble with suture work, and when possible, approximation by adhesive plaster might in many instances be preferable. Metal clips might be employed.

5. Dressings: The total allowance of cotton is 96 rolls and of gauze 1,200 meters. This amount would be totally inadequate and would be insufficient for the first dressing of the casualties, making no allowance for that used in (1) battle first-aid work, (2) permanent dressings for gun crews, (3) reserve-gun dressings, and (4) subsequent dressings for six days. It is estimated that from six to eight times the allowed amount would be required to provide for all. Should the ship's allowance become exhausted there are supplies on board in other departments from which the surgeon may im-

provise material. Probably the best substitute for cotton and gauze is oakum, of which considerable supply is carried and which would presumably be available. Should this prove insufficient cotton waste may be employed. This may be rendered fairly sterile by boiling in galley coppers.

Both these substances have been used with excellent results. We will have to deal with pus wounds after the first few days, and it is probable that such fairly sterile dressings and equipment would be very satisfactory. Under this head bandages would be included.

The amount of such material is:

Bandages, gauze, assorted, doz., 60	720
Muslin, meters 180, sufficient for bandages 2 inches wide and 60 inches long	2,244
Total bandages	2,964

This is a large number, but it would probably be not more than one-third sufficient unless bandages were used more than once. There are, however, as in the case of dressings, many articles in the ship's stores from which bandages may be made, such as—

Muslin.	Light canvas.	Flax.
Drill.	Underclothes.	Bunting.
Flannel.	Flour sacks.	Table and bed linen.

Without doubt the question of bandage material would never annoy the surgeon.

6. Splint material.—The comparatively small amount of this material habitually kept in the Medical Department would not be adequate to the demand for it after action. The thin boards used as pattern material in the pattern shops of all the navy yards is excellent for this purpose, and a supply should be laid in and kept on hand. The general storekeeper keeps "pattern stuff" in store, also plaster of Paris, and the carpenter has wire cloth.

From this résumé it will be seen that the stores of the Medical Department, supplemented by the large and various amount of articles under the charge of the general storekeeper will be amply sufficient for the care of the assumed casualities, and while it would be advisable to increase certain items in preparation for actual warfare, no increase, with the possible exception of anesthetics, would be absolutely necessary.

Among the articles the allowance of which it is advisable to increase are:

Anesthetics, twice the present allowance.
Cotton, for dressings, six times the present allowance.
Gauze, for dressings, twice the present allowance.
Ligatures, for dressings, twice the present allowance.
Muslin, for bandages, three times the present allowance.
Adhesive plaster, four times the present allowance.
Ethyl chloride, four times the present allowance.
First-aid packets, two for each person on board.

Some reference has been made to the large amount of useful stores held for issue by the general storekeeper and from which the surgeon may draw many articles of value and obtain useful substitutes in times of need. In addition to the previously mentioned articles the following might, after action, be found of service:

Linseed, castor, and other oils, lime, ponchos (rubber sheets), alcohol, memorandum books, silver nitrate, towels, soap, vaseline, lanterns, candles, agateware pitchers, buckets, basins, bowls, trays, hospital cots, mattresses, sheet lead, ammonia, and clothing.

A BACTERIOLOGICAL INDEX FOR DIRT IN MILK.

By J. J. Kinyoun, assistant surgeon, Medical Reserve Corps, United States Navy.

In a previous paper by the writer and Mr. L. V. Dieter the results of a bacteriological examination of the milk supply of Washington, D. C., were given. This study comprised about 1,200 samples of milk and cream and continued over a period of 14 months. Since that time similar examinations have been continued without interruption, until now nearly 3,000 samples have been examined.

Our first work was to determine the actual conditions of the milk and cream in Washington, its treatment in the several dairies or milk depots here, and finally, the most important, its condition as it reached the consumer.

These examinations, taken together with similar ones made subsequently, have brought out certain facts which do influence the character and quality of the city milk supply.

In the first place, the methods of supplying and handling milk have been radically changed from those employed 20 years ago. At that time nearly all of the milk consumed here was produced within a short distance from the city. Now, by reason of the larger consumption and the increased facilities in transportation, milk is being brought here from places within a radius of 75 to 100 miles as contrasted with that of former times. Then for some cause or other, of which I know not, there has been less milk produced in nearby places as contrasted with former times. Now the bulk of the milk supply comes from places more remote.

Twenty years ago a number of bacteriological examinations of milk supplied to Washington was made by the writer. Nearly, if not all, the samples examined were from milk produced within a short distance of the city. These, taken as a whole, contained less bacteria than the milk at the present time. The explanation for this is that there is now a much longer interval between the time of collection and distribution than formerly existed. Whether it was any cleaner or better milk than we now have can not be said, because no

attempt was made to differentiate the kinds of bacteria present, all estimates being made on the total bacterial content.

As said before, the milk supply not only of Washington city but nearly every large city in this country has been revolutionized, by reason of its increase in population, necessitating bringing milk from distant places; a longer time elapsing between collection and distribution during which it is exposed to variations of temperature, careless handling en route and in the milk depots.

Various suggestions have been made as to what should be a maximum bacterial standard for milk and cream. Some States and municipalities have enacted laws, or passed ordinances defining these standards; these vary according to circumstances, having been made with reference to the total bacterial content. No one of these so far as I know has legislated as to the kinds of bacteria in the milk, unless it is the plan of grading milk as proposed by the New York milk commission.

This plan is to grade the milk according to the class. It is a most excellent scheme, but I fear that it would be next to impossible to carry it into effect, because of the number of persons which this plan will require for making examinations. So far as Washington is concerned, with its 1,200 who daily ship milk into the city, it goes without saying that to carry out such a plan would require such a large increase in the personnel that Congress would not provide the means. So the question resolves itself into doing the best that can be done within the limit of the means supplied.

The milk supply of any city resolves itself into having this supply as clean as possible, and this largely depends upon how the milk is collected. All things being equal, a clean milk will always make a better showing than a dirty milk, and its commercial life is much longer, so all the safeguards that can be reasonably thrown around the production of milk should be insisted on with this end in view. The scoring of a dairy farm has now been largely adopted by both States and municipalities. The scoring of dairy farms was first proposed by Dr. W. C. Woodward, health officer of the District of Columbia, and was used before it was adopted and promulgated by the Department of Agriculture. The scoring of the dairy farm has been of greatest value in the production of clean milk and, while the results are not yet perfect, there has been progress in the right direction, and as the factors which relate to cleanliness become better understood and more perfectly carried out so the quality of the milk will improve.

Since the beginning of our examinations of milk and cream much attention has been given to the kinds of bacteria found. This has in no way lowered the value of the total bacterial content as indicative of the character of the milk; but isolating certain groups of bacteria,

taken together with the total content, gives a much better idea of both the character and quality of a milk than the total content.

In making these examinations, the methods employed have been on the same lines as those adopted and recommended by the laboratory section of the American Public Health Association. There were some minor differences which do not change the final result, but were done for the sake of economy. One set of dilutions was plated, instead of two, and was incubated 48 hours at room temperature. This plan was adopted after a study of the two sets of plates of 1,000 samples. It was found that those plates incubated at 37° showed only 10 per cent excess over those incubated at room temperature. No gelatine plates were empolyed for lack of facility and because these are not considered of much importance, of so little that their employment should be special. In addition to the above-mentioned methods special media were employed for the isolation and study of groups of bacteria, viz, the colon group and the streptococci.

Streptococci in milk were estimated by the indirect method, that is to say, dilutions of the milk were plated in lactose-peptone bile and incubated for four days at 37° C. Then preparations from these several dilutions were made, stained, and examined. If there were present the typical chains of streptococci in a given dilution, say $\frac{1}{1,000}$ c. c. or $\frac{1}{10,000}$ c. c., as the case might be, it was then estimated that there were at least 1,000 or 10,000 streptococci present, and no further attempt was made to isolate or identify the several strains—that is, the colon group and streptococci. The isolation of the colon group of bacteria has heretofore been attended with so many difficulties and details of technique that its employment in all instances was impracticable in the routine examination of milk. We have for the past three years been employing for the isolation of the colon group a modified Endo's medium which has given most excellent satisfaction, so that we feel that it is of so much importance that the method of its preparation and use is inserted here. I quote from a paper published by myself and Mr. L. V. Dieter, entitled "On the Preparation of Endo's Medium":

It is always better to make the medium in considerable quantities, say in lots of 6, 8, or 10 liters. The amount of agar can be reduced to 2 per cent instead of 4 per cent as originally given.

Peptone, Witte	grams	80
Meat extract (Leibigs)	do	80
Salt	do	40
Agar-agar powdered	do	160
Water	cubic centimeters	8,000

Mix the peptone, salt, and agar with sufficient water to make a smooth paste, and then add the balance to make 8,000 c. c. Add the meat extract and, without attempting to mix this, place in an Arnold sterilizer and steam until all is dissolved. This usually requires about an hour.

When it is melted it is then cooled to about 55° C. and titrated to +1, using phenolphthalein as an indicator. It is then placed in tall beakers, steamed for a half hour and then allowed to solidify. This is best done by allowing the beakers to remain in the sterilizer overnight. In the morning a greater part of the precipitate will have gravitated to the bottom. The solidified agar is removed from the beakers, placed on paper and all the precipitate is cut off and discarded. The rest is cut in small portions, replaced in the beakers, and melted. It is then allowed to cool down to about 55° C. and standardized in the following manner:

Eighteen lots of 10 c. c. are placed in an equal number of sterile test tubes, and these tubes are divided into two series—one the acid and the other the alkaline. To the acid series are added the following amounts of N/1 HCl, viz, 0.01, 0.03, 0.05, 0.07, 0.09, 0.1 c. c. To the alkaline series the following amounts of a 2½ per cent solution of sodic carbonate are added, 0, 0.01, 0.03, 0.05, 0.07, 0.09, 0.3, 0.5, 0.7, 0.9 c. c. Then to each of these tubes, and while hot, add 1 c. c. of a 10 per cent solution of lactose C. P. (crystal), 1 c. c. of a 5 per cent solution of sodium sulphite, freshly prepared, and 1/10 c. c. of a half saturated alcoholic solution of basic fuchsin. Pour, then, contents of each tube thus prepared into a sterile Petri dish and allow to harden. The surface of each plate is inoculated with typhoid and colon bacilli from 24-hour-old bouillon cultures; one-half of the plate streaked with typhoid, and the other with colon. The plates are incubated for 24 hours, and the one showing a typical and luxurious growth of both typhoid and colon is selected as a standard for the stock, and the alkali or acid is added to bring the stock to the selected index.

We have found it most convenient for routine examinations to divide the stock medium into 100 c. c. lots and employ for this purpose a round bottle holding 120 c. c. which has been marked to 100 c. c. The bottles are filled up to the 100 c. c. mark and then sterilized in the Arnold sterilizer for an hour on two successive days. It is then stored. When the medium is used it is melted; 1 gram of lactose crystals is added, and as soon as dissolved 5 c. c. of a 5 per cent solution of anhydrous sodium sulphite (freshly prepared and hot) are added and followed by 1 c. c. of a half-saturated alcoholic solution of basic fuchsin. All these are thoroughly mixed, when it is ready to pour into plates. For determining the colon content in milk by the direct method we have found it to be of advantage to employ a Petri dish of 150 m. m. diameter and pour into the plate sufficient of the medium to cover the surface and allow this to harden. Then the milk is pipetted directly on the medium and just enough of the medium is poured in to mix with the milk, so that when it hardens the milk will be held in a thin layer of the medium. This procedure will not only prevent spreading, but allow the colon colonies to produce their characteristic reaction within a shorter time than would occur otherwise. In case the medium is employed to isolate the typhoid bacillus from dejecta the same procedures are observed as set forth in the original papers. We have found that a 2 per cent agar answers every purpose and a 4 per cent agar is not necessary.

What is the significance of the colon group in milk?

The colon group comes from the intestinal canal of man and animals; indirectly may be found in soil, water, and food. This is such a well-established fact that it does not need discussion. When it gains access to food and drink it must be from one of these sources. Water frequently contains colon bacilli, and sanitarians agree that in determining the wholesomeness of a water for drinking purposes the colon bacillus is the best index for purity. The value of a drinking

water diminishes in a direct ratio to the size of the colon content. All this is based on water as polluted with sewage, which frequently is the carrier of a pathogenic agent like cholera, typhoid, bacillary dysentery, and diarrheal diseases of infants. The colon bacillus per se may not cause disease, but some members of the colon group may do so.

When milk is contaminated by the colon group it indicates that it owes its presence there to uncleanly methods at the time of milking, or to the collection of the milk in dirty vessels, or to contamination from the air.

The greater proportion of the colon bacilli gains entrance to the milk at the time of milking, and they owe their presence directly to fecal matter, which has gained access to the pail by dirty, filthy cows; equally so the hands of the milker.

It is believed to be a conservative statement that over 90 per cent of the market milk found to contain colon bacilli in considerable or large numbers receives its greatest contamination at the time of milking. This statement is based on the study of the examinations covering the past three years.

Next in order is the contamination coming from the pail and other containers. This comes from their dirty condition, through lack of careful cleansing and sterilization, or from a contaminated water in which the containers and utensils are washed. These containers may be dirty, containing all kinds of extraneous matter which has undergone bacterial decomposition, and may or may not contain colon bacilli; but if these be present they have their origin in a previous colon-contaminated milk or water. A number of examinations have been made from such containers, and where the colon group was found there was, as a rule, a greater disproportion between it and the total number than was found in the samples of milk.

On the other hand, should any of the colon content be due to an infected water with which the containers are washed, or the milk diluted, it must be considered not merely as a dirty milk, a filthy milk, but also a dangerous milk, unless in the latter case it can be definitely established that the colon bacilli in the water are wholly of animal origin, and could not come from man.

When the colon content of the milk is large one may be sure that it bears direct relation to the amount of fecal matter which has found its way into the milk, because it is a well-established fact that when there has been a careful preparation of the cow by cleansing the hair, by removing the dried fecal matter from the hair and skin, washing and drying the teats and udder with clean water and cloths, the employment of the small-mouthed pail, and milking in a clean, well-lighted room, not only is the colon group reduced to a minimum, but all other bacteria as well.

With regard to the presence of *B. coli* in the air of stables and milk rooms, it does exist in a small degree at times, and at those times in particular when the dust is stirred up, either at feeding time, or when the cows are driven in or out of the stable; but the number present in the air is so small that it has but little or no effect on the milk. It is possible for a few, but a very few indeed, to gain entrance to the milk by this route, but it would have so little effect that it can for all practical purposes be considered a negligible quantity.

The colon content of the milk depends upon the amount of the organism added; that is to say, that it is proportional to the amount of fecal matter put in the milk. It matters not when or how, it is in proportion to the care and cleanliness at the time of collection, the cleanliness of the container, and methods of handling. Its rate of multiplication is about the same as other bacteria present, and its increase depends upon the temperature and time. Up to a certain point all the several groups of bacteria increase in a fairly regular ratio, then when a certain degree of acidity is reached (the souring of the milk), the colon group may remain stationary or diminish, but in no case has it been observed to disappear entirely, even from the sourest milk and cream. Temperature plays a most important part in the development of all the groups of bacteria found in milk, and the more nearly the body temperature is reached the greater their multiplication. The converse is true—the lower the temperature the less bacterial development.

There is a larger proportion of samples of market milk which contain colon bacilli than is found in water; but on analysis it will be found that the contamination is not as heavy as in the winter months.

Now, when the analyses are grouped in one having the colon group in less numbers than 1,000 per c. c., and the other 1,000 and over, same curious and suggestive figures in percentages can be made. If the number of the colon group be now divided by the total bacterial content, the good milk, that is to say that with low colon content, shows a coefficient 0.0001 or less. Whereas the group having a large colon content, either proportionately or numerically, has a coefficient 0.001 or more. Such coefficients have been constructed from the averages taken for the same year and groups of months, as for the colon percentages which are shown in the following table:

	January.		March.		June.		September.	
	Good.	Bad.	Good.	Bad.	Good.	Bad.	Good.	Bad.
1911	0.00006	0.05	0.00025	0.02	0.000015	0.009	0.0002	0.08
1912	.00005	.032	.00008	.003	.0001	.009	.00033	.02
1913	.00002	.005	.000026	.0052	.00001	.008	.0002	.02
Average for three years	.000037	.019	.000026	.0034	.000015	.009	.00024	[illegible]

Here it is shown that in the good milks there is present on a general average, one colon bacillus to 50,000; in the dirty milks, one colon bacillus to 555. This rule works out quite evenly for the 3,000 samples which have been examined during the past three years, and it is believed will be a fairly good guide in determining how the milk has been treated; in other words, whether it is a clean milk or a dirty milk.

The streptococcal content shows wide variations, but as a rule, where the colon content is high the streptococci will also be high, but not in the same proportion as for the colon. In some cases the streptococci are present in great numbers, and when this is the case the cause is usually found to be a diseased udder. The streptococci present are also derived from the intestinal canal. No coefficient has been worked out as for the colon group, but where the streptococci are present in numbers of 100,000 or more, taken together with a large colon content, it is prima facie evidence that the milk has been contaminated with fecal matter, and in generous quantities.

The colon coefficient has not been found of much service in determining the condition of the containers for milk, particularly when the bacteria reach enormous numbers. In this case its coefficient might show just the same percentages as for a good milk. Nor is this method applicable to an imperfectly pasteurized milk, in which the colon content has been almost entirely killed. A milk which has been subjected to the pasteurizing process, which has not killed the colon content, fails in its object, for just as long as the colon group is present there is no assurance that if a milk be liable to carry disease it will continue to do so, for diphtheria, tuberculosis, typhoid fever, and dysentery require the same degree of heat or a little more to be killed than does the colon group.

Unfortunately there has arisen a false notion among the milk dealers and some others that any kind of milk can be rendered pure and safe by pasteurization, and attempts are being constantly made to do this, not for rendering the milk safe from conveying disease, but for keeping the milk in a salable condition for a longer time. A milk of a high bacterial content, and particularly one containing a large colon content, is extremely refractory to pasteurization, and the difficulty is in proportion to the size of the bacterial content. On the other hand, a good milk of low bacterial content is easy to pasteurize, and this is the only kind of milk that should be subjected to the process. Milk with a high bacterial content should not be pasteurized, but boiled.

From my observations I am strongly of the opinion that cleanliness in the production is the most important of all factors entering into the milk problem, and every means should be taken consistent with the economies of the milk supply. Keeping the colon group to a

minimum means cleanly methods in collection, transportation and distribution. When we find the colon bacilli absent or in extremely small numbers in raw milk we can rest assured that we are dealing with a clean milk. By the employment of a standardized Endo medium for isolating the colon group, this can be done with ease and certainty. This medium also serves excellently for determining whether the colon group has been removed from milk in the pasteurizing process. The identification of the colon group in market milk is of the greatest importance in determining the degree of cleanliness of such milk, and could be employed as an index of purity.

BRIEF DESCRIPTION OF PROPOSED PLAN OF A FLEET HOSPITAL SHIP BASED UPON THE TYPE AUXILIARY HULL.[1]

By E. M. Blackwell, surgeon, United States Navy.

CONSTRUCTION AND GENERAL DIMENSIONS.

Length over all	feet	425
Length, water line	do	400
Beam	do	[illegible]
Depth, molded	do	[illegible]
Draft, loaded	do	2[illegible]
Displacement	tons	7,[illegible]

The hull will be steel, and the ship will be an oil burner with turbine engines, twin screws, a sustained speed of 14 knots per hour, and a cruising radius of about 10,000 miles. It will have five decks above the water line, so the wards and living spaces will be high above the water, with an abundance of light and natural ventilation under ordinary conditions. It will have sufficient beam, will be roomy, and, with the heavy weights placed below and the ship properly ballasted, it should be very comfortable, steady, and seaworthy. Turbine engines will do away with the unnecessary noise and vibration of the machinery, and oil fuel will make it easy to keep the ship clean and sanitary and do away with all the disagreeable features of coaling ship.

ARRANGEMENT OF COMPARTMENTS.

There are five decks above the water line and two below, making seven in all. The arrangement of compartments on the various decks from forward aft is as follows:

A. The superstructure deck has a deck house in the forward part of which is the pilot house, with chart and navigator's storerooms attached, and on top of which is the bridge. Then in succession come the master's cabin and quarters, wireless office and stateroom, and

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[1] Plans prepared under the direction of the Surgeon General of the Navy and recommended by the General Board of the Navy.

two other offices and the commanding officer's cabin and quarters. Aft of the smokestack are the mess room and quarters for 10 officers of the Naval Auxiliary Service.

On this deck are davits and cradles for 16 boats and there are 2 on the deck below, making 18 large boats in all. There should be patent davits, which would require very few men to hoist and lower the boats.

B. The forecastle deck extends from the bow to frame 64. It is quite spacious and high above the water and is an excellent place for exercise and recreation for the crew and convalescent patients.

Aft of this is the upper deck, extending back to frame 150, where there is an 8-foot break in the deck to separate it from the poop deck, on which the isolation wards are located. It has a large deck house on it containing the main operating room with sterilizing and wash rooms adjoining mess room and quarters for 10 medical officers, and mess room and quarters for 12 sick officers. A wide promenade deck surrounds the deck house, giving ample space for exercise and recreation for officers and patients.

Aft of this is the poop deck with deck house containing 6 isolation wards with 68 beds and a separate toilet for each ward. There are quarters for the hospital apprentices in attendance, a disinfecting room, and a galley, making these wards capable of subsisting themselves with little or no communication with the rest of the ship. There is a wide deck around the wards, thus enabling the patients to be out in the open air.

Aft of the isolation wards is a space where animals for laboratory purposes are to be kept.

C. The main deck has the anchor engines, seamen's wash room and toilets and lamp room forward. Then comes a large recreation room for patients, with barber shop and toilet attached. From this a 6-foot gangway runs aft on each side to the stern of the ship. Next to the recreation room is a ward of 52 beds, with toilet and dressing rooms, for venereal cases.

Aft of these are the executive and other offices, laboratories and examining rooms, small operating room, and library and board rooms, all centrally and conveniently located for carrying on the work of the Medical Department of the ship.

The galleys come next, grouped around the boiler room uptake. There are an officers', a crew's, and a hospital galley, bakery, mess-issue room, and commissary and chief cook's quarters. They open into a wide thwartship passage with a stairway leading below to the wards, and there is a dumb-waiter leading from the diet kitchen below to the sick officers' mess above.

Another group of quarters with eight rooms, mess, and toilet for sick officers comes aft of the galleys. There is then a wide thwart-

ship passage with a large cargo hatch in the center, aft of which are the mess and quarters for 10 sick warrant officers, making a total of 30 rooms in all for sick officers.

Aft of the warrant officers' quarters is a large recreation and mess room for chief petty officers, next to which is the autopsy room, aft of which is space for an incinerator for disposing of soiled dressings, trash, and garbage when the ship is in port when such refuse can not be thrown overboard.

D. The second or ward deck has the main wards of the ship. Forward are the carpenter's shop and ship's petty officers' quarters, aft of which, between frames 32 and 103, are 4 large wards, 2 medical and 2 surgical, with a combined capacity of 192 beds, with 2 toilet, 2 dressing, and 2 quiet rooms, centrally located and convenient to all wards. There are rooms for hospital apprentices on duty, a hydrotherapeutic room, and a room for sterilizing utensils.

Aft of the wards, around the boiler-room uptake, are the diet kitchen, scullery, quarters, mess, and toilets for hospital stewards and mess stewards and cooks. Aft of these, between frames 131 and 190, are 4 wards with a combined capacity of 160 beds. The steering engine room is on the extreme after part of this deck.

There are wide passages and gangways on this deck; all parts of it are very accessible and none of the wards have to be used as gangways. Communication with the decks above and below is made very easy by elevators, stairways, ladders, and hatches.

E. The third or berth deck has the seamen's quarters with 32 beds forward, aft of which comes the hospital apprentices' quarters, with 60 beds, and wash and toilet rooms. Between frames 59 and 104 is a large open space for convalescent patients' mess room and extra berthing space. Into it open four strong rooms for insane patients, the post office, canteen, rooms for the chief master-at-arms and his assistants, and four rooms for stowing the bags and hammocks of patients. Between frames 104 and 139 is the space for the auxiliary machinery of the ship, aft of which come the quarters for the machinists and firemen with 36 beds. Then comes a wide thwartship passage with cargo hatch in the center and large cargo ports at each end. Aft of this passage are the messmen's quarters, with 20 beds, ship's prisons, toilets, disinfecting rooms, and laundry.

F. The forward and after platforms or storeroom decks have the ship's storerooms forward, aft of which come the medical storerooms. Between frames 83 and 139 are the engine, boiler and fuel space, aft of which are the cold-storage rooms and the commissary storerooms.

G. There are three holds, one forward for ship's stores, aft of which is one for medical stores. Then comes the engine, boiler, and fuel space, aft of which are the dead rooms, after hold, reserve oil tanks, and fresh-water tanks of the ship.

Proposed Plan of Fleet Hospital Ship, Based upon the Type of Auxiliary Hull Recommended by the General Board of the Navy.
Prepared under the Direction of the Surgeon General of the Navy
by E. M. Blackwell, Surgeon, U. S. Navy, March 31, 1913.

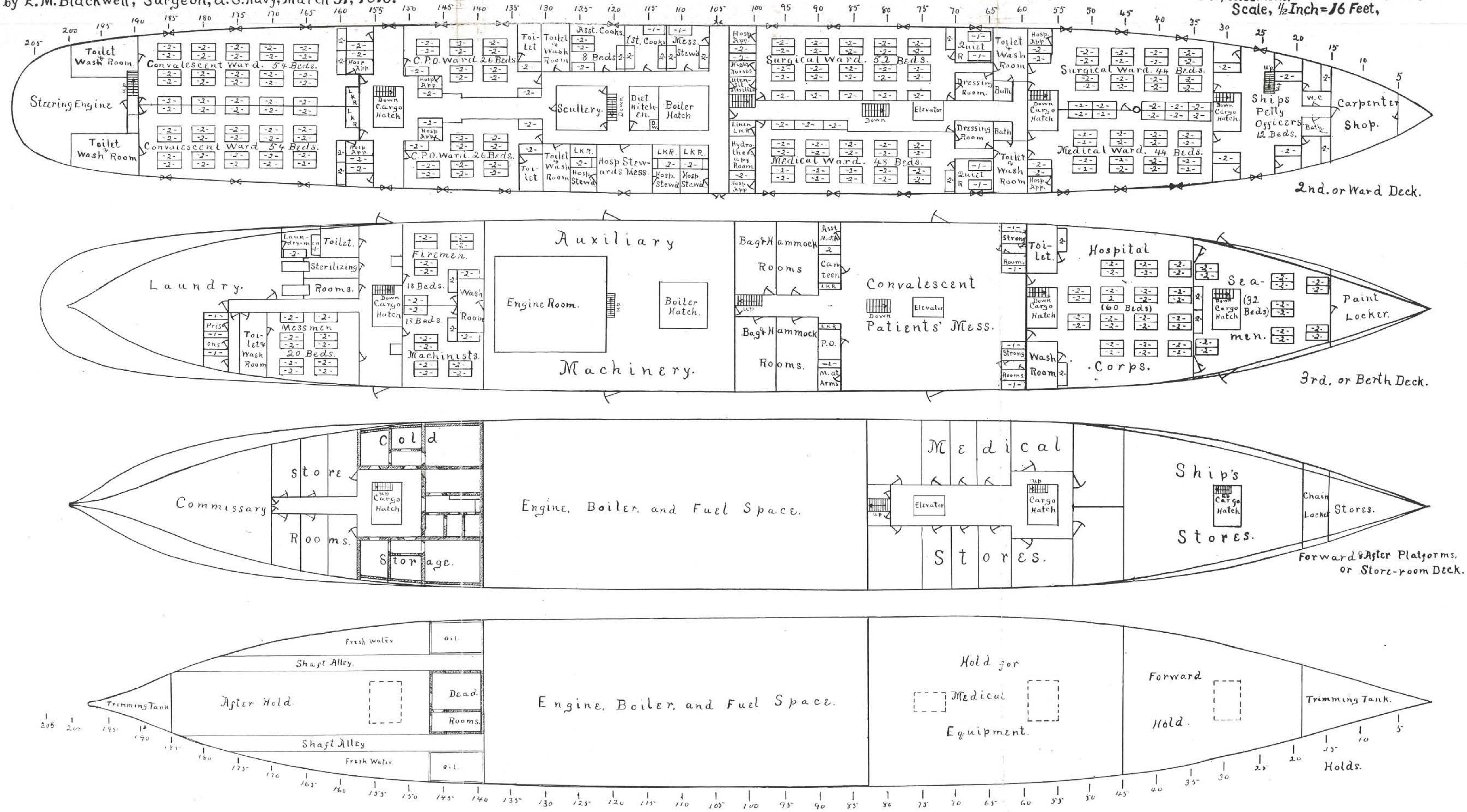
BERTHING CAPACITY.

Officers & Crew, ------------ 250
Sick { Officers, --Rooms, ---30 ; Men, ----Beds, --476 } 666 } 916.
Extra berthing space, 160

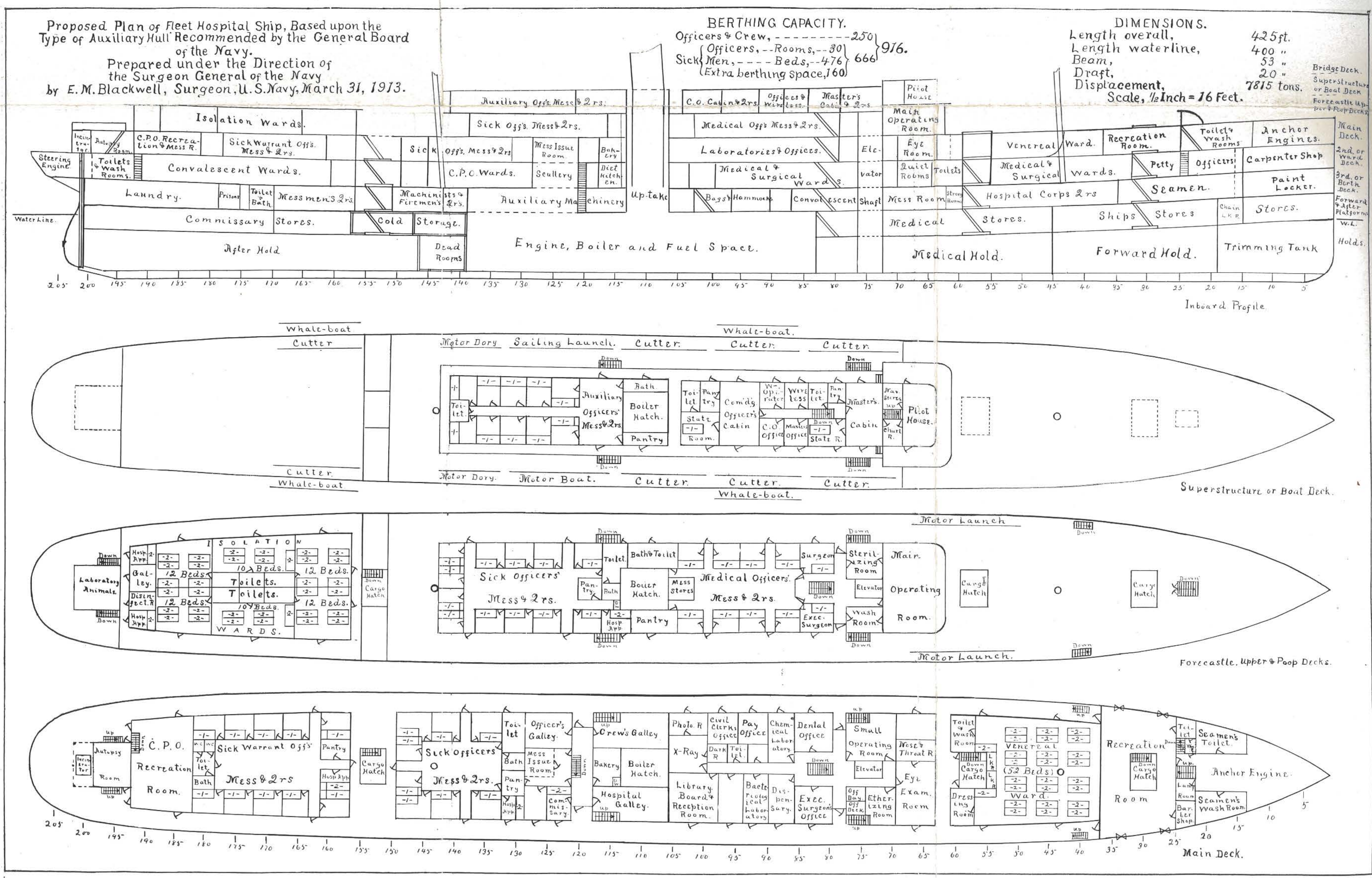
DIMENSIONS.

Length overall,	425 ft.
Length waterline,	400 "
Beam,	53 "
Draft,	20 "
Displacement,	7815 tons.

Scale, ½ Inch = 16 Feet,



HOSPITAL SHIP.



HOSPITAL SHIP.

BERTHING CAPACITY.

1. Officers and crew:			
(*a*) Naval—			
Officers' rooms	12		
Hospital Corps, berths	90		
		102	
(*b*) Auxiliary—			
Officers' rooms	14		
Crew, berths	134		
		148	
Total			250
2. Patients:			
(*a*) Officers' mess and quarters as follows:			
		Rooms.	
Mess and quarters, upper deck		12	
Mess and quarters, main deck		8	
Mess and quarters, main deck		10	
Total			30
(*b*) Enlisted men, wards, and beds as follows:			
		Beds.	
Poop deck, 6 isolation wards		68	
Main deck, 1 venereal ward		52	
Second deck, 2 surgical wards		98	
Second deck, 2 medical wards		94	
Second deck, 2 C. P. O. wards		52	
Second deck, 2 convalescent wards		108	
Third deck, 4 rooms for insane		4	
Total			476
(*c*) Extra berthing space:			
		Berths.	
Main deck, 2 recreation rooms		60	
Third deck, 1 mess room		100	
Total			160
Total berthing capacity			916
Total berthing capacity for patients			666

The cubic capacities of the various wards and berthing spaces for patients are as follows:

Wards.	Deck space.	Capacity.	Beds.	Space per bed.
	Sq. ft.	*Cu. ft.*		*Cu. ft.*
2 surgical	2,565	20,520	98	210
2 medical	2,445	19,752	94	210
2 C. P. O.	1,360	10,840	52	210
2 convalescent	2,640	21,130	108	195
6 isolation	1,600	14,400	68	212
1 venereal	1,680	13,440	52	258
2 recreation rooms	1,560	12,480	60	205
1 mess room	2,700	21,600	100	216
Total	16,470	134,202	632	[1] 212

[1] Average.

The medical officers, auxiliary officers, and sick officers will have individual staterooms opening into mess rooms, each stateroom having an average capacity of 650 cubic feet. Each stateroom will have one or more large air ports which will be so located that they can be kept open in nearly all kinds of weather and will give ample light and ventilation to the rooms. Each group of quarters for officers has a large mess room, and, as each stateroom opens into this room, it affords additional air space for the occupants.

It might be desirable and advisable to dispense with some of the rooms in the sick officers' quarters and convert the spaces occupied by these rooms into wards for officers. This would give 6 rooms in the sick officers' quarters on the upper deck and ward space for 10 beds, 16 in all; and 4 rooms and ward space of 6 beds, 10 in all, in the sick officers' quarters on the main deck; and 4 rooms and ward space for 10 beds, 14 in all, in the sick warrant officers' quarters; or a total of 14 beds in rooms and 26 in wards, or 40 in all, as against [illegible] as at present.

All the offices and laboratories have large air ports with excellent light and natural ventilation. The wards and berthing spaces on the poop, main, and second decks have large square ports supplemented by smaller air ports. Under ordinary conditions these will give all the light and ventilation necessary; but should the wards be crowded or the ship at sea in rough weather it would be necessary to supplement this by artificial ventilation.

The berthing space for the crew, hospital apprentices, and patients on the third deck are not so light and airy as on the other decks, and it will be necessary to have artificial ventilation most of the time when these spaces are occupied.

AUXILIARY MACHINERY.

Most of the auxiliary machinery will be on the third deck between frames 104 and 139, around the boiler-room uptake and the engine-room hatch. In this space will be the dynamos, ice machines, distilling plant, ventilation machinery, machine shop, etc. Thus nearly all the machinery will be centrally located and as far removed as practicable from the wards and berthing spaces, so the crew and patients will not be disturbed by the noise of its operation.

The dynamos should be large enough to run all the auxiliary machinery, including the anchor engines, and the distilling plant should be of large capacity. There should be two large ice machines, each capable alone of keeping the cold-storage rooms down to the proper temperature for preserving fresh provisions.

There should be vacuum-cleaning machinery and all parts of the ship should be cleaned in this manner. The sterilizing, fumigating,

and disinfecting apparatus should be of the most improved kind, and the plant should be large enough to meet the requirements of the ship and the fleet.

There should be adequate artificial ventilation of both the supply and the exhaust systems. All parts of the ship should be connected by telephone. The laundry equipment should be sufficient to do the work for all the hospital department, officers, and Hospital Corps. Special motors should be installed in various parts of the ship where necessary.

There should be special cranes for hoisting patients on board at sea in rough weather. They should be installed on the main deck, two forward, one on each side about frame 62, opposite the thwartship passage at that point, and two aft, one on each side about frame 152, opposite the thwartship gangway there.

SANITARY FEATURES.

Sanitation aboard ship can never be ideal on account of the lack of space and the consequent crowding and congestion that are necessary and the difficulty of obtaining proper ventilation. Aboard hospital ships all insanitary features should be eliminated as far as practicable, and in pursuance of this end the workmanship aboard should be as plain and simple as possible. Angles, corners, ornamentations, cracks, dead and inaccessible spaces, etc., should be eliminated, as they collect and harbor dust, dirt, microbes, and vermin, and make cleanliness and proper sanitation much harder to attain. The various apparatus aboard should be such that they can be easily cleaned or sterilized.

All berthing spaces should be light and airy and have good natural ventilation, supplemented by artificial ventilation when necessary. Particular attention should be paid to the furnishings of the wards. The cots, lockers, and other furniture should be movable in order that they may be taken out of the wards, cleaned and sterilized. This would greatly facilitate cleaning the wards. All curtains, hangings, rugs, mats, etc., should be washable and capable of thorough sterilization.

The plumbing should be the most modern and improved kind, and the greatest of care should be exercised in installing it, especially in all wash rooms, toilets, pantries, sculleries, galleys, and operating rooms. In no case should there be any connection between the salt and the fresh water systems.

An incinerator is very necessary for the destruction of garbage, trash, and other refuse when the ship is in port. All wards, berthing spaces, mess rooms, pantries, galleys, offices, laboratories, operating rooms, etc., should be thoroughly screened against flies, mosquitoes,

and other winged insects. They should be capable of being easily hermetically sealed for purposes of fumigation and disinfection.

As there has never been a hospital ship that was built up from the keel for that purpose, the construction of one will be rather a new departure in shipbuilding, and many minor changes and additions will probably have to be made during the course of construction; but the general plan and arrangement of compartments in this ship apparently meet all requirements and there will probably be little or no departure from them. The problems to be confronted in building a ship of this kind will be very different from those encountered on a merchantman or warship, and it is too much to expect that the first hospital ship built will be an ideal one. In order to be satisfactory, the hospital ship must be built under the direction of competent naval constructors and engineers, advised and assisted by medical men of wide experience with hospitals and hospital ships, with an intimate knowledge of the various apparatus needed for the equipment and a good understanding of practical hygiene and sanitation.

The attached plans are necessarily incomplete, as the writer is not a draftsman or a naval architect. They will have to be worked out in full detail by a competent naval constructor and a skilled draftsman. The object of the writer is to give a practical, convenient, and economical arrangement of the various compartments of a hospital ship.

THE DIAGNOSTIC VALUE OF THE CUTANEOUS TUBERCULIN TEST IN RECRUITING.

By E. M. Brown, passed assistant surgeon, United States Navy, retired.

I wish to invite the attention of the medical officers of the service to the undoubted value of the cutaneous tuberculin test, and the possibilities it offers for a practical application in recruiting work, with a subsequent reduction of tuberculosis in the service.

Statistics are dull and we can dispense with them, but those who have given the subject thought will admit that most of our service tuberculosis is not contracted in the service, but existed prior to enlistment, and that the active cases we daily meet and survey to hospital for final transfer to Las Animas are latent or old cases that have blazed up again, as the result of exposure incident to life aboard ship. This is not in criticism of those who do recruiting. Everyone who has had it to do knows the difficulties that beset the path of the examiner. We know that direct questioning of the recruit is of very little value, statements to the contrary by Dr. Butts notwithstanding. Some applicants will lie, and lie valiantly. If questioned, most of them give a history of having always been strong and husky; very few have had even so much as a very light attack of the

measles. The examiner has to rely almost entirely on his physical examination and such few questions as he can ask without arousing suspicion. I once had this rather unique experience. A big fellow appeared at the office here in Los Angeles for examination for machinist's mate, second class. The office was, and still is, located in a building in front of which run interurban cars, and there is not a half minute in the day when one's ears are not assailed by their thunderous noise. I percussed and auscultated this man faithfully, and found him acceptable for enlistment. Later he let slip some question about Arizona that aroused my suspicions, but on questioning him I found that he had been employed as an engineer on the Santa Fe, but not liking the country he had gone East again. Nearly two years later, while I was visiting at Mare Island, I saw this man again, and on his learning that I was "out of the service," as he expressed it, he became confidential. He said: "You pretty near caught me when you were asking me all about Arizona and how I came to be out there. Well, I went out there after I had had several hemorrhages, and I was out there over a year before I was able to take on with the Santa Fe." Naturally I asked him what he was in the hospital for, and I felt relieved when I learned he was there for a hernia operation. The point I wish to make is this, that here was a man who had been seriously ill with tuberculosis; who partly, at least, on account of conditions under which his examination had been held, had been passed as fit for the service. Had a cutaneous tuberculin test been applied he would probably have shown enough reaction to warrant his rejection. That he had finished nearly half of his enlistment without breaking down was fortunate; many men under similar conditions do break down.

What then are to be the determining factors in accepting recruits? Two questions confront us.

(1) Is the recruit tubercular?

(2) Is he latent or active, and if latent what are his chances of breaking down under service conditions?

1. Even those who are not tuberculo-monomaniacs (i. e., tuberculosis specialists) will admit that very few human beings get through life without infection, and the most conservative will admit that over 80 per cent of all cases coming to post-mortem show evidences of tubercular invasion. The first question is fairly well answered, then, if we say that most men accepted for service are tubercular.

2. Is the case latent or active? What practicable means have we at our command to aid in answering this question? Presupposing that all the medical men on recruiting duty are experts in physical diagnosis, it would still be possible for a good many latent undesirables to slip through. Undoubtedly they do get by, or else our ships are in themselves criminally infectious, and we can not credit

that. The diagnostician who specializes in tubercular work is very deliberate. He takes a most careful history, which is reliable because the patient is trying to help; the temperature curve is charted over a period of several days; not one, but two and often three physical examinations are made; the laboratory findings are studied, and always a tuberculin test applied. All this in a recruiting office would be impossible, but a properly applied and interpreted cutaneous test would be invaluable. Its practicability would soon be proved by a lessened rate of incidence among the men. A good modification of the von Pirquet test that requires about three minutes to apply is as follows:

Scrub a good sized strip of the arm with alcohol. Allow the alcohol to dry. Heat the scarifier in an alcohol flame. Plunge the scarifier into a Stender dish containing alcohol. This cools the point, and if removed at the right moment, enough heat will remain just to dry the instrument. Dip the point of the scarifier into a bottle of Koch's old tuberculin (human), then with moderate pressure with the index finger on the head of the scarifier, quickly rotate it around once by turning the handle between the thumb and second finger. There should be no bleeding. Wipe the scarifier with cotton saturated in alcohol, heat in the flame, plunge into alcohol, then allow to dry and cool. Dip the point in Denys' bouillon filtrate (human) and scarify a spot about three-fourths of an inch below the first spot. Repeat the cleaning process carefully and scarify a third spot with Koch's old tuberculin (bovine). The fourth spot receives Denys' bouillon filtrate (bovine). The fifth receives nothing and is put on to serve as control. The best scarifier is made from the small pocket screw driver, with detachable handle, sold by opticians for tightening glasses. What is known as a diamond point can be put on with a fine file or stone, and is done by beveling off half the point to an angle of about 10 degrees, while the other half is beveled in the opposite direction. A jeweler's drill has the same cutting edges and can be used to advantage. It is well to keep in mind that both heat and alcohol precipitate tuberculin, and render it inert, hence care must be exercised in having the scarifier dry and cool before dipping it into the tuberculin. After the five abrasions have been made it is best to wait a few minutes, then with separate bits of plain cotton dry the spots. Do not mix the tuberculins by using the same pledget of cotton to dry them all with. It is not necessary to apply a protective dressing, and no precaution need be exercised when bathing or using the arm. It takes from 24 to 48 hours to get good reaction. If there is a tubercular focus in the body, that person will be sensitized and we have—

tuberculin+sensitized cells=reaction.

Now to interpret reactions so that they will be of value in recruiting.

No reaction means one of three things: (*a*) A body so overwhelmed with toxins that the power of sensitization is lost. In other words a third-stage case that could be rejected by inspection alone (*b*) A case in which the infection has occurred so long before that the cells have finally lost their sensitization, and the case is to all intents and purposes free from tuberculosis and is acceptable as a recruit. (*c*) The noninfected case, of which we must admit there are a few.

Slight reactions (where the area of redness is not greater than twice the area of the scarified spot). (*a*) The third-stage case that still retains some resistant energy. Such a reaction appears promptly and disappears quickly, showing that the cells are but poorly sensitized. Here again the physical signs would be so well marked as to cause rejection. (*b*) What is known as the delayed reaction appears in from 48 to 72 hours and persists for days and sometimes weeks. In such cases the reaction means a lesion some place in the body where the tubercle bacilli are still present but practically nonactive, as in an old healed fibrotic lung area or in some of the glands. It is the type of reaction we so frequently see in apparently normal healthy individuals, and the recruiting officer need have no hesitancy in accepting such cases for enlistment if they are otherwise physically fit.

Moderate reactions (where the area of redness approximates the size of a dime). Such cases should all be rejected, as it means that no matter where the focus is, the lesion is active. In many instances where such a reaction is seen the recruiting officer will be tempted to take the man on account of sturdy physique, but he must always bear in mind that there must be an active lesion some place and that the risk of acceptance is too great. In cases where the involvement is in some other part of the body beside the lung the cutaneous test will be the only means of detecting active lesions. Likewise a great many incipient cases show about this amount of reaction and would be passed over as having slight colds without the test.

The marked reaction. This type of reaction is seen in several conditions as, for example, in incipient cases; in cases that have successfully resisted one or more previous attacks and the immunity is high; in glandular cases that are quite active but physically in good condition; in most cases of bone tuberculosis; in third stage cases that have been doing well and suddenly get softening of an infected area or develop a new focus.

In all doubtful cases it is better to reject, even if now and then a good man is lost to the service, and you are frequently informed by the officer in charge of the station that your percentage of rejections is very high. The records of the bureau will show the great expense incurred from accepting tubercular recruits, and it is better to err on the safe side than to go on filling up the ranks with prospective

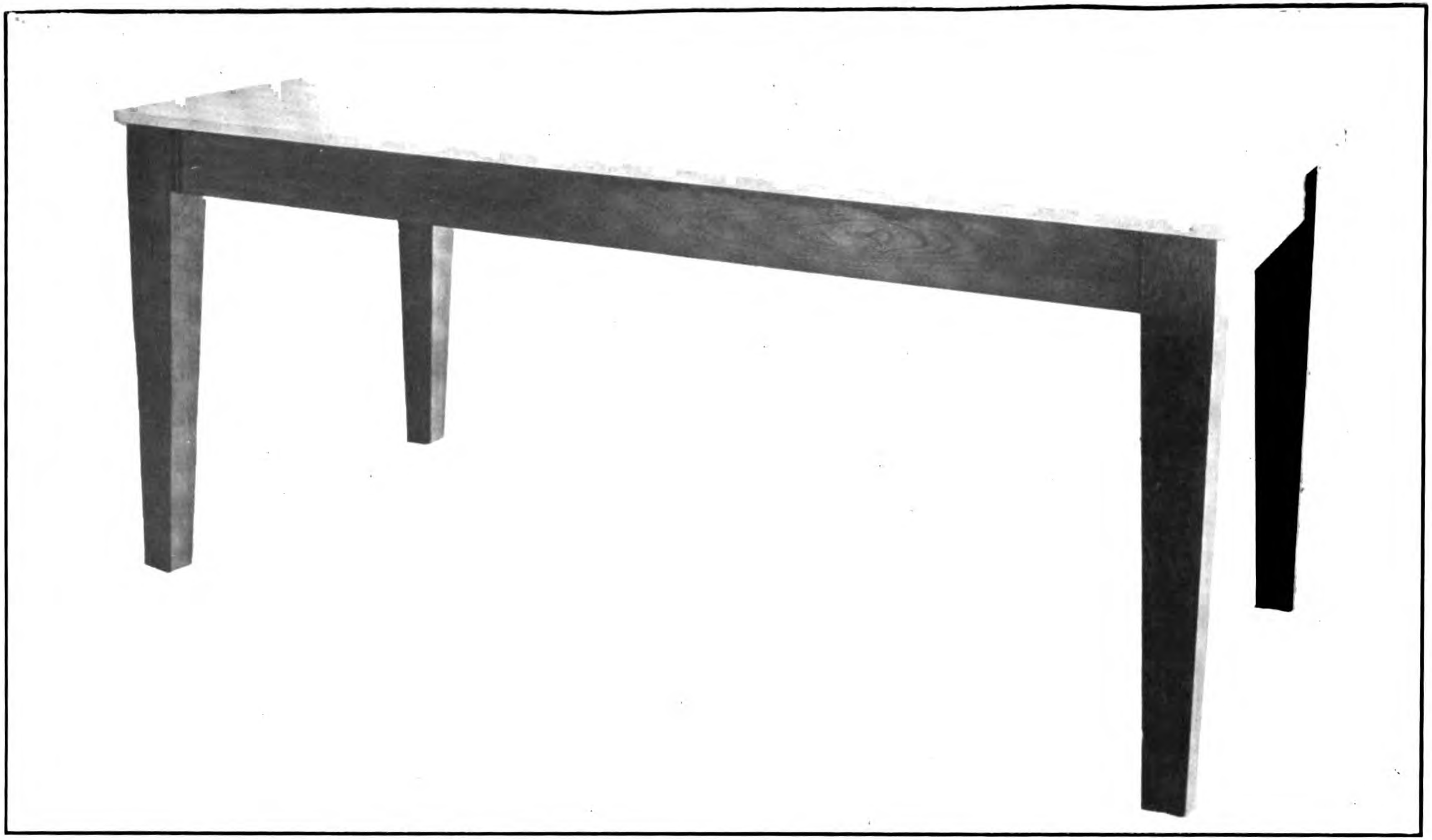
patients for Las Animas. Only those cases should be taken that show no reaction or those showing the type of reaction described as delayed. Always keep in mind that a reaction of any importance means an active lesion.

Just a word as to why it is best to use the four types of tuberculin. Let those who love controversy fight it out as to whether there is a human and a bovine type of the bacillus, the fact remains that one frequently obtains reaction to one type and not to the other in cutaneous tests. It has also often been observed that the Denys' filtrate reacts more strongly in the active cases, while in the nonactive cases only the Koch's old tuberculin will sometimes show.

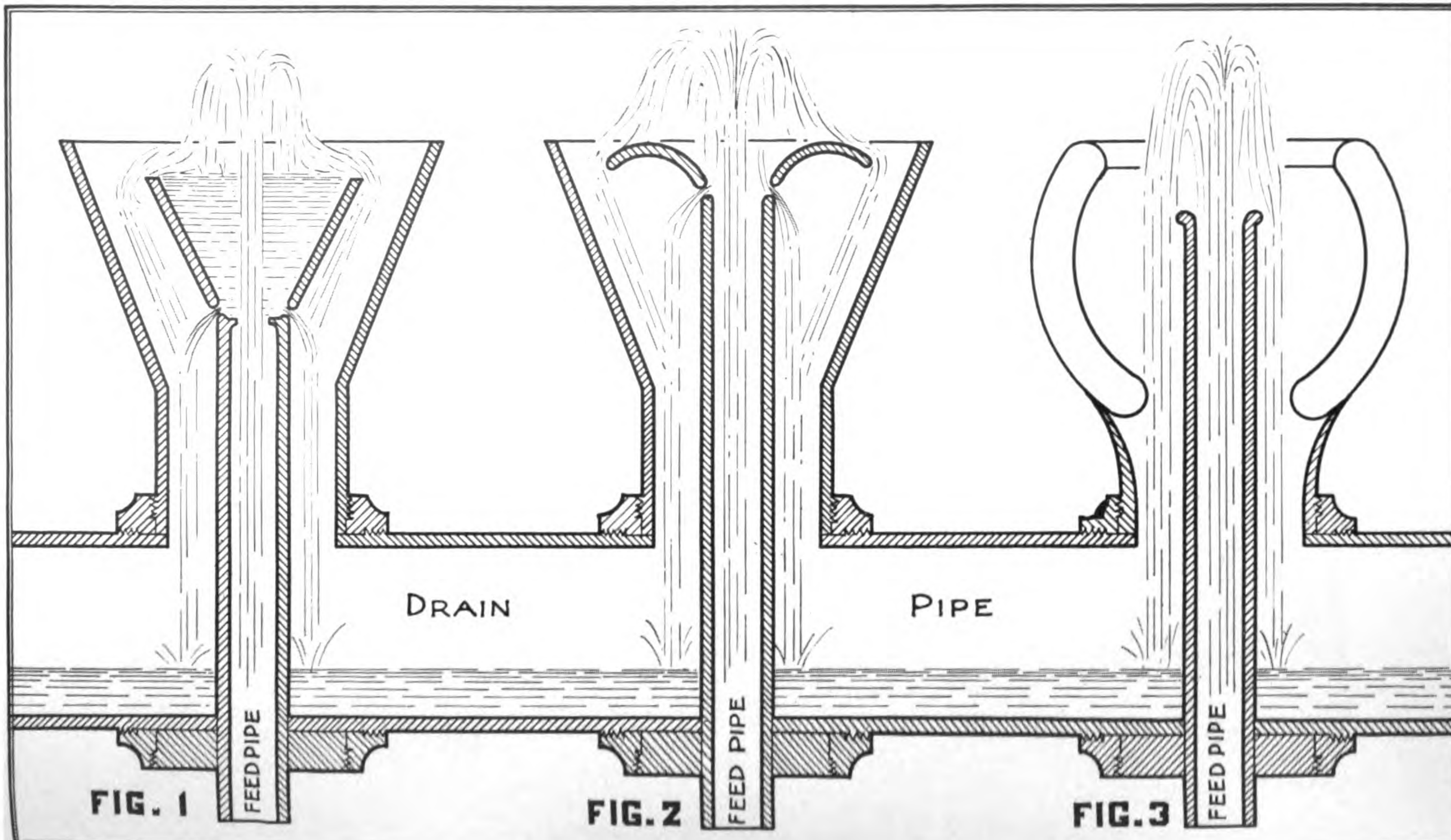
U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the Pathological Collection, United States Naval Medical School, April to July, 1914.

Accession No.	Tissue.	Diagnosis.	Collected by or received from—
1089	From dog	Schistosomum japonicum	Asst. Surg. R. H. Laning, U. S. S. Saratoga.
1090	Intestine	Sarcoma of intestine	Passed Asst. Surg. J. R. Phelps, U. S. Naval Hospital, Chelsea, Mass.
1091	Blood	Benign tertian malaria	Passed Asst. Surg. H. L. Kelley, U. S. S. North Carolina.
1094	Tissue	Blastomycosis	Asst. Surg. W. H. Massey, M. R. C.



MESS TABLE.



DRINKING TERMINALS FOR SCUTTLE BUTT.

SUGGESTED DEVICES.

A SANITARY MESS TABLE FOR HOSPITALS.

By F. M. BOGAN, surgeon, United States Navy.

The tables now in use in the mess rooms of this hospital are believed to be superior to anything of the kind elsewhere. They have porcelain tops, made in a special size by the Vitrolite Co., and the frames were built by yard labor from a simple design of my own. The tops are a solid, snow-white porcelain composition ¾ inch thick, 8 feet long by 3 feet wide. These rest on solid ash frames, which have no cross pieces to interfere with cleaning under the tables or on which the feet can be placed. The tops are cemented on the frames, and there are no cracks or open spaces in which dirt can collect or vermin hide.

The tops project about 1½ inches beyond the frames and have smooth rounded edges.

The polished porcelain surface can be kept absolutely clean and does not chip, crack, or scratch readily. These tables have been in use here for five months, subject to the hard wear and tear which is to be expected from Navy patients and the heavy Navy crockery, and have given complete satisfaction.

A table of this size will seat eight people.

A SUGGESTED IMPROVEMENT OF THE NAVY SCUTTLE BUTT.

By E. M. BLACKWELL, surgeon, United States Navy.

The mechanism of any sanitary drinking fountain must be such that it is impossible for the lips of the person to come into contact with the cup, funnel, or spout while drinking; otherwise, it will not be sanitary. Some members of the general public or of a ship's company will not use the proper care, precautions, or judgment unless forced to do so, and will place their lips upon the rim of the cup, funnel, or spout if it is possible, and thus make a source of contamination or infection. In other words, any machine, apparatus, instrument, or device for the general use of the public or a ship's company must be made "fool proof" to insure its being used in the proper manner.

While the drinking fountains in use on the scuttle butts aboard ships of the Navy are a great advance over the old-fashioned drinking cup, it is possible for them to become contaminated and thus spread infection. The writer has seen men aboard ship drink with their lips in contact with the rim of the cup or fountain instead of drinking from the bubble in the center of it. This is made possible by the fact that the rim of the inner cup or funnel of the fountain is about one-quarter of an inch above the rim of the outer one, thus making it possible to place the lips in contact with the rim and drink from the overflow. This could be easily remedied by placing the rim of the inner cup or funnel about one-quarter of an inch below the rim of the outer one, thus making it impracticable to place the lips in contact with the rim and forcing the party to drink from the bubble in the center.

The accompanying diagrams illustrate the mechanical principles which will make contact of the lips with the rims of the cups or funnels of the fountains impossible, and thus prevent contamination. Figure I is a modification of the fountain used in the Navy. The lip of the inner cup is one-quarter inch below instead of above the rim of the outer cup. Figure II is probably a better form of fountain than Figure I. Figure III is probably the best form of fountain. It has an outer cup of porcelain with a pipe in the center, terminating about half an inch below the rim of the cup. The water bubbles through this pipe, rising about an inch above the top of the cup and enabling the person to drink from the bubble and making it impossible to drink with the lips in contact with the spout or cup. This is the form of fountain that has been most generally adopted for public drinking fountains.

CLINICAL NOTES.

MALARIA CURED BY NEOSALVARSAN.

By Fred M. Bogan, Surgeon, United States Navy.

The case of C. is especially interesting because it proves two things: First, the specific effect of neosalvarsan in malaria, *in this case;* and second, the extremely rapid action of the intramuscular administration. It will be noted that C. was admitted to the sick list on May 12, 1913, with a diagnosis of lobar pneumonia, which was changed to malaria, many tertian parasites being found in blood smears. He remained in the hospital for 115 days, during which time he received daily large doses of quinine (1 gram), returned to duty, but was never really well. Ten days after returning to duty chills returned and there was a maximum temperature of 106.2° F. Large doses of quinine were administered, and also succinimid of mercury, without affording any relief.

Immediately upon his admission to the hospital he was given an intramuscular injection of 0.45 gram neosalvarsan. He received no other treatment. There was a slight rise in temperature during the two succeeding days, but from that time until discharged to duty there were no further symptoms and the patient gained rapidly in weight and strength.

After leaving this hospital in October, 1913, C. was transferred to the U. S. S. *Eagle* and proceeded to surveying duty in the West Indies. The conditions were favorable for a return of malaria, but in a letter received from him under date of March 9, 1914, he states that he has had no return of the disease.

The following is copied from his health record:

H. R. C., O. S., U. S. NAVY.

U. S. S. *Wheeling*, May 12, 1913. Pneumonia, lobar. Line of duty. Chill at 11 a. m., cough, slight expectoration, pain under sternum, vague pains over body, headache, face cyanotic, shortness of breath. Dullness sixth space right side between vertebral column and scapula; prolonged high-pitched expiration; few coarse rales. Temperature, 104° F. Pulse, 138; respiration, 22. Constipated. Patient was very much exposed to cold weather while on watch. Heart sounds and action regular. 1 a. m., examined and admitted.

R. A. U. S. Naval Hospital, Portsmouth, N. H. May 12, 1913. Pneumonia, lobar; duty as above. On admission blood count, white cells 8,800. At 6 p. m. temperature, 99° F; respiration, 20; pulse, 80; is sweating. Given milk 500 c. c.

May 13. No symptoms; temperature, pulse, and respiration normal. Prescribed quinine sulph. gm. 1; at 11 a. m. soft diet. Stained blood smears show many malarial parasites (tertian); temperature, 104° F. at 2 p. m.

May 14. Discharged for admission with malaria; duty; infection while in Tropics. Quinine sulph. gm. 3, daily.

June 30. Slowly gaining weight.

July 14. Improving.

August 2. Had nausea, with chill and prostration; temperature, 105.2° F. Given intramuscular injection quin. hydrochlor. gm. 1.

August 3. Temperature normal.

August 5. Improving.

August 15. Is now getting quinine sulph. 1 gm., each morning.

September 4. No symptoms; to duty. Subsisted 115 days.

U. S. S. *Southery*. Readmitted September 14, 1913. Malaria; duty; infected in Tropics. Typical chill followed by fever; temperature 106.2° F.; quinine grs. xx in a. m. and grs. v in p. m. of September 13. This date temperature is subnormal. On September 11 had a chill and on September 13, as above.

September 15. 8.45 a. m., deep injection mercury succinimid gr. 8/5 experimentally. Feels well. Temperature subnormal. Chill at 9.45 a. m.; temperature rose to 103.2° F.

September 16. Temperature subnormal.

September 17. 8.30 p. m., injection mercury succinimid gr. 4/5. Chill at 9.45 a. m.; temperature rose to 103.3° F.

September 18. Temperature subnormal.

September 19. Chill about 6 a. m.; 7 a. m. temperature 104.2° F.; quinine grs. xx.

September 20. Transferred to naval hospital, Portsmouth, N. H.

R. A. U. S. Naval Hospital, Portsmouth, N. H. September 20, 1913. Malaria, as above. Intramuscular injection gm. .45 neosalvarsan.

October 1. There has been no further elevation of temperature.

October 9. No symptoms; to duty. Subsisted 19 days.

A CASE OF RUPTURE OF THE BLADDER WITH FRACTURE OF THE PELVIS

By H. F. Strine, surgeon, and M. E. Higgins, passed assistant surgeon, United States Navy.

W. F.

C. L. D., O. S., age 18. He was doing duty as a mounted orderly at Vera Cruz, Mexico. About 5.30 a. m., April 30, 1914, a street car struck his horse and he was thrown beneath the car fender. When received aboard the *Solace* at 8 a. m. on the same day, he complained of pain in the lower part of the abdomen and in the right thigh and leg. He was unable to walk and could not void urine. A few drops of blood had escaped from the urethra. About 200 c. c. of bloody urine were obtained by catheter.

On admission: Temperature 100° F.; pulse 90. Pain subsided during the day, but at 8 p. m. temperature was 103° F.; pulse 120. Operation: A suprapubic incision was made down to the bladder. On entering prevesical space a considerable quantity of serosanguineous

fluid, having a distinctly urinous odor, was present. The wound was dried and an incision made into the bladder. A rent about 2 inches in length was found on the right lateral wall, involving the mucous and muscular coats. Bleeding had practically ceased. Bladder was closed over a drainage tube and drainage tubes placed in the prevesical space.

Urine came away clear after the second day. There was some infection of the prevesical space which drained well. Bladder tube was removed on the twelfth day. Temperature varied from 99° to 101° F.

On May 14, 1914, patient was transferred to the naval hospital, New York. On June 1, abdominal wound had closed and urine was passing by urethra.

X-ray of this case showed a greenstick fracture of the descending ramus of the os pubis. No fracture in the region of the bladder wound could be determined.

CLINICAL OBSERVATIONS ON THE USE OF SUCCINIMID OF MERCURY.

By T. W. Reed, passed assistant surgeon, United States Navy.

From my short experience of 15 months in dealing with succinimid of mercury in the treatment of infectious diseases on board ship, I consider it one of the most, if not the most, valuable medicinal preparations in the outfit of a naval medical officer.

Excellent in all forms of syphilis, which is always at hand, it heals the initial lesion rapidly, clears up mucous patches, and renders the patient a fit subject to mingle on board ship as soon as if he had been given neosalvarsan. It is given in much less time, with much less bother, and without nearly as much risk to the patient, particularly on board a small ship, not provided with an operating room and when proper assistance is not to be had. It is excellent in gonorrhea, particularly the chonic cases, and in complications which necessitate prolonged confinement in bed, and in the persistent joint cases. It is excellent in tonsillitis, and all medical officers know how much tonsillitis there is in the Navy. It is very beneficial in all infections accompanied by septic absorption.

Surg. Wright and Passed Asst. Surg. Schmidt of the Navy report excellent results in some cases of lobar pneumonia and epidemic cerebrospinal meningitis. I have had no experience in the treatment of these two conditions.

The writer has come to a few conclusions in the administration of this drug. (1) Thorough antisepsis by boiling both needle and water in which the succinimid is used and in which dissolved. Application of tincture of iodine to site of injection. The writer has not had an

abscess or sign of infection in probably over 100 injections. (2) Injections are practically painless. (3) Succinimid is much more easily kept on hand and prepared for use than the salicylate of mercury, or the preparations of salvarsan, and the results are unquestioned. (4) Tremendous doses can be given, and if a patient has a pyogenic process the mercury almost vanishes. Only does the patient become mercurialized when all toxin is rendered inert in the body or the organisms become avirulent; that is, if any reacting ability is left. Medical men, both in and out of the Navy, seem astounded at the doses given and comment on the liability of sudden poisoning. A little experience will show that the doses herein mentioned can be given with impunity.

Below follow the notes on eight cases recently treated by intensive doses of succinimid of mercury:

Case 1.—B. E., Sea. Admitted to sick list December 15, 1912, with a diagnosis of gonorrheal arthritis. Ran an acute and painful course involving both ankles. Given rest in bed and methyl salicylate and olive oil locally. Practically no improvement until January 12, 1913, when given 9/5 gr. succinimid of mercury, intramuscularly; on January 14, given 7/5 gr. succinimid. On January 17, three days after the last injection, patient felt so well that he was able to go to duty. Swelling, fluctuation, and pain in both ankles had disappeared almost like magic. No mercurialism and no return of symptoms. I might add that the treatment of this, my first case with succinimid, which, before the administration of this drug had so resisted other treatment, inspired me with a desire to give this drug a further trial and was just the demonstration that I needed. This case was treated immediately after my conversation with Dr. Wright concerning the efficaciousness of this drug.

Case 2.—R. J. S., O. S. Admitted to sick list February 18, 1913, with syphilis. Although admitted with syphilis, in addition to the hard indurated sore, macular rash, and pharyngitis, this man was literally covered from head to foot with boils; he also had a large carbuncle on one of his buttocks. He was pale, thin, anemic, and almost a physical wreck, although only a boy of 18 years, and one who had just enlisted. He was immediately given 9/5 gr. succinimid of mercury intramuscularly; in 48 hours more he was given 7/5 gr., and 48 hours later was given 5/5 gr. Six days elapsed before he was given any more. Although he had no symptoms of mercurialism, I was afraid to give any more medication at this time. After the lapse of six days, he showing no symptoms of mercurialism, I again gave him 5/5 gr., and in 48 hours 5/5 more. The next day he had diarrhea and some soreness of the mouth and teeth, although in the interim his symptoms, both of syphilis and general furunculosis, had

disappeared; and on March 5 he was sent to duty. He immediately began to pick up in weight and strength, and it was only a short time until he was hale and fat and kicking around the deck as lively as any of his shipmates. Following his discharge to duty on March 5, he was given intramuscular injections of salicylate and succinimid of mercury once a week on alternate weeks for three months. Then he was given a rest for three months, and the former treatment resumed. He has never had an untoward symptom since.

Case 3.—J. T. S., F–1. Admitted on June 23, 1913, with cellulitis of the right hand. In three or four days the infection had spread from an involument of the back of the hand and ring finger, to halfway up the forearm. It was deeply indurated, swollen, and had all the signs of a very severe infection. His temperature oscillated for many days, and he was profoundly septic. Multiple incisions were made in the palm and on the back of the hand, and but little pus was evacuated. He was treated by rest in bed, mild stimulation, and antiseptic compresses, with dressings wet twice a day. After several days of this treatment, I decided to try succinimid again. He was given 9/5, 7/5, 5/5 gr. on alternate days, and the effect that followed the administration of this was remarkable. The process became limited at once; there was free discharge of pus, the old sinuses began to close and his temperature remained at normal. After an interval of three days, he was given 5/5 gr. on two successive days; this last dose salivated him a little, although during the first three injections he had no symptoms of mercurialism at all. After the third injection he was able to be up and about.

Case 4.—M. H. S., C. P. Admitted December 26, 1913, with furunculosis and tonsilitis. He was given antiseptic dressings for the former disease, and alkaline and antiseptic treatment for the latter disease. He was on the sick list for 10 days and in bed without any improvement. He had refused administration of the "needle," as he called it, until January 6, when he consented to its use. On the 6th he was given 5/5 gr. During these five days he suffered no pain from these injections and he had no mercurialism, and on January 11, he was so much improved he was sent to duty. His tonsillitis was of the subacute type; tonsils swollen, very tender, and the crypts full of discharging pus. This case has never returned for further treatment.

Case 5.—E. F., C. P. Admitted to the sick list on January 14, 1914, with syphilis. Secondaries well out on body; around the anus were mucous patches which were discharging very profusely and which were extremely foul. There were also in this vicinity several well-developed condylomata. He was put on intramuscular injections of succinimid of mercury, as were the other cases, with the result that in 15 days he was sent to duty practically well.

Case 6.—L. E. M., C. P. Admitted to the sick list February 23, 1914, with syphilis. This case resembled the preceding, except that the condylomata were larger and more numerous. He was given succinimid as before, with the result that the patient was sent to duty in seven days. Condylomata almost disappeared.

Case 7.—H. M., W. R. C. Admitted to the sick list on March 9, 1914, with chronic cystitis. He had attacks of pain and tenesmus; urine cloudy and full of pus. Gonococci present in examination of smears. On March 9 given 9/5 gr., on March 11 given 7/5 gr., and on March 13 given 5/5 gr. On March 14 urine had cleared up and other symptoms had disappeared. No symptoms since.

Case 8.—A. B., Cox. Admitted to sick list on March 11, 1914, with cellulitis of the face. Infection began on the left upper lip and gradually spread over the cheek up to the left ear and to the left lower eyelid. Dense, brawny infiltration. No tendency to focus or point. Much depression with high evening temperature. Treated with wet antiseptic dressing and mild stimulation for three days without any beneficial effect. On March 14 given 9/5 gr. succinimid of mercury intramuscularly, with the result that in 24 hours the whole process had softened and constitutional symptoms had disappeared.

Aside from these eight cases, all of which manifested wonderful results of treatment with succinimid of mercury as prescribed by Wright, I would say that I have treated several cases of acute follicular tonsillitis and one of rheumatic fever, the latter complicated by purpura, by this method with the same excellent results.

POINTS IN THE POST-MORTEM LIGATION OF THE LINGUAL ARTERY.

By O. J. Mink, passed assistant surgeon, United States Navy.

The ligation of the lingual artery is of importance as each medical officer at some time in his career is required to do this operation and usually at a time when failure is disastrous. That the procedure as ordinarily described is not easy can be judged from the fact that it is not uncommon to see skillful operators, working on the cadaver, not only fail to find the artery but become hopelessly lost in the anatomy of this region. This result is difficult to explain when we read the clear account of the anatomy and note with what detail the steps of the operation are given. Considerable anatomical material being available during the past winter, an opportunity was presented for the study of the anatomy and surgery of the artery.

Post-mortem anatomy of the lingual artery: The lingual artery arises from the external carotid, between the facial and the superior thyroid, slightly below the level of the greater cornu of the hyoid. Passing obliquely upward on the middle constrictor of the

pharynx, about three-eighths to one-half an inch above the cornu, it passes beneath the posterior edge of the hyoglossus muscle. It then turns downward and passes forward beneath the hyoglossus, parallel with and about one-quarter inch above the greater cornu. The digastric and stylohyoid muscles have no relation to the artery while it is beneath the hyoglossus, except that both are well above the field. The artery lies beneath a triangle formed by the digastric and stylohyoid above, the greater cornu of the hyoid below, and the posterior border of the hyoglossus behind. The floor of the triangle is formed by the hyoglossus and is crossed by the hypoglossal nerve.

Post-mortem ligation of the lingual: Two operations are described, one in which the digastric is pulled downward and the artery ligated in Lesser's triangle and the other in which the artery is ligated in the triangle below the digastric previously described. The former seems more popular, as the latter is described principally in the older textbooks. However, it will be found post-mortem that it is almost an impossibility to move the digastric. It is drawn tightly under the jawbone and the slight amount of displacement possible would only bring it over the location of the artery. It is while endeavoring to displace this muscle downward and to produce Lesser's triangle that most operators come to grief.

The following technique has been used with both speed and success on about 30 cadavers.

Make a slightly curved incision, convexity downward, about 2 inches in length, with the center over the greater cornu, dividing the skin, fascia, and platysma. This exposes the lower tip of the submaxillary gland lying in a pocket of fascia produced by a division of the deep cervical fascia. The principal guide from this point is the top of the greater cornu, which is easily felt. The fascia over the tip of the gland is opened, the gland displaced slightly upward, and the deeper layer of the fascia under the gland divided. Very little upward displacement of the gland is necessary and often it is only necessary to incise the fascia between the gland and the greater cornu in order to expose the field. This exposes the triangle bounded above by the digastric muscle, below by the greater cornu, the floor being formed by the hyoglossus muscle.

This triangle is crossed anteroposteriorly and usually in the upper part by the hypoglossal nerve. The ranine vein may or may not be in this triangle. With a pair of forceps divide the hyoglossus muscle in the direction of its fibers and the artery will be plainly seen.

The points to be remembered are:

1. The greater cornu of the hyoid as a guide.
2. The triangle below the digastric muscle.
3. The hypoglossal nerve as a guide to the artery.

4. Division with forceps of the hyoglossus in the direction of its fibers.

The points and conclusions refer entirely to work on the cadaver as no opportunity for work on the live subject has been furnished.

No illustrations are submitted, as the cuts in Grey, Binnie, and Bickham illustrate the points in the anatomy and surgery, especially those in Grey and Binnie.

NOTES ON THE WOUNDED AT VERA CRUZ.

By H. F. STRINE, surgeon, United States Navy, and M. E. HIGGINS, passed assistant surgeon, United States Navy.

The *Solace* arrived at Vera Cruz at noon on April 22. The transfer of the wounded from the ships and shore stations began immediately. Fifty-five were received in all, the major portion during the first day. Twenty-nine of the cases were not of serious import. The following were of special interest:

Case 1.—N. P., O. S. Gunshot wound of skull. The bullet produced a scalp wound and grazed the skull on the right side of the parietal bone. Unconscious on admission with paralysis of left arm and leg. Operation showed depression of the inner table and a clot beneath the dura. Dura was opened and clot evacuated. Wound was drained down to dura and closed. No infection. On May 22 patient was up and about.

Case 2.—E. H. G., O. S. Gunshot wound of face. Entrance anterior to right ear. Exit left cheek. The facial artery was cut on the left side. The large lacerated wound of the cheek healed rapidly. Small fistula of right parotid gland remains.

Case 3.—J. G. P., Pvt. Gunshot wound of the chest. Three wounds over the left scapula and a wound in the left axilla. Hemoptysis and high temperature for four days. X-ray showed comminuted fracture of fourth rib and fragments of metal jacket and bone in the axilla. Several pieces of bone and metal jacket were removed. There was a mild infection of all wounds but temperature soon went to normal and patient convalesced rapidly.

Case 4.—H. P., F-1. Gunshot wound of chest and spine. Bullet entered the left chest at the sixth rib on mid-axillary line, passed downward, and severed the cord in the dorsolumbar region. Hemothorax and complete loss of sensation and motion in the lower extremities with loss of function of bladder and rectum. The pleural cavity was twice aspirated and 500 and 1,000 c. c. of fluid blood evacuated. Death occurred on the fourteenth day. When this patient was admitted there were signs of internal hemorrhage and marked abdominal rigidity. An exploratory laparotomy was performed, but there was no intestinal injury.

Case 5.—E. G. W., O. S. Gunshot wound of abdomen. Entrance in the hypogastrium. Exit right buttock. The spermatic cord was severed and the rectum perforated. There was a large amount of blood in the right side of the scrotum. Operation. The spermatic cord was tied and the right testicle removed. Both wounds suppurated and discharged feces. On May 23 patient was convalescing, but was still discharging some fecal matter from the posterior wound.

Case 6.—J. McM., Pvt. Gunshot wound of the abdomen. Entrance hypogastrium. Bullet passed downward through the scrotum and entered right thigh, lodging in the muscles. No infection. Bullet not removed.

Case 7.—C. F., civilian. Perforating wound of abdomen. Entrance near the anterior superior spine on right side. Exit right buttock. Some hemorrhage for two days. Mild infection at wound of entrance. No signs of intestinal or bone injury. Was sent to hospital ashore on May 5 for convalescence.

Case 8.—G. D., Pvt. Perforating wound of abdomen. Entrance 2 inches above the navel. Exit above the anterior superior spine of the ilium on the right side. No shock, hemorrhage, or signs of peritonitis. Complained of some "soreness" in right lower quadrant, but had no other symptoms.

Case 9.—F. N. C., Sea. Gunshot wound of abdomen. Bullet entered the abdomen above the symphysis pubis and passed out on the right buttock between the great trochanter and the spine of the ischium. No infection. Paralysis of the extensor muscles of the right foot. Injury to the sacral plexus.

Case 10.—W. O. K., C. T. C. Gunshot wound of arm. Bullet entered upper third of left arm anteriorly, struck the humerus with explosive effect, producing great comminution and destruction of soft tissues to the elbow. Amputation.

Case 11.—M. F., Sergt. Gunshot wound, right shoulder, perforating. Entrance anteriorly. Fracture of outer end of clavicle and margin of the glenoid cavity. No infection. Prognosis as to function good.

Case 12.—M. A., civilian. Gunshot wound of upper extremity. Deep gutter wound of posterior aspect of right elbow, opening the joint. Infected. Followed by severe cellulitis of forearm. Forearm incised and drained. Infection subsided and patient went ashore on the seventh day.

Case 13.—H. A. B., O. S. Gunshot wound of right wrist. Small perforating wound of right wrist. No infection and no impairment of function.

Case 14.—I. L. K., Sea. Gunshot wound of left arm and back. Both wounds were perforating, probably by the same bullet. They

healed without infection. He expectorated a little blood for two days. "Numbness" in fingers supplied by the median nerve. Fourteen days after the injury there was a profuse secondary hemorrhage from the wound of the arm. Hemorrhage controlled by pressure, but recurred with greater intensity on the following day. Operation showed the median nerve to be partially severed and a hole about 3 millimeters in diameter in the brachial artery. Artery was tied and nerve sutured. Hemorrhage evidently coincident with separation of slough caused by burn. Collateral circulation was promptly established and wound healed by primary union.

Case 15.—E. P. P., Pvt. Gunshot wound of back and right forearm. Wounds of back healed rapidly and without infection. The bullet perforating the forearm caused some splintering of the radius. Mild infection which soon subsided.

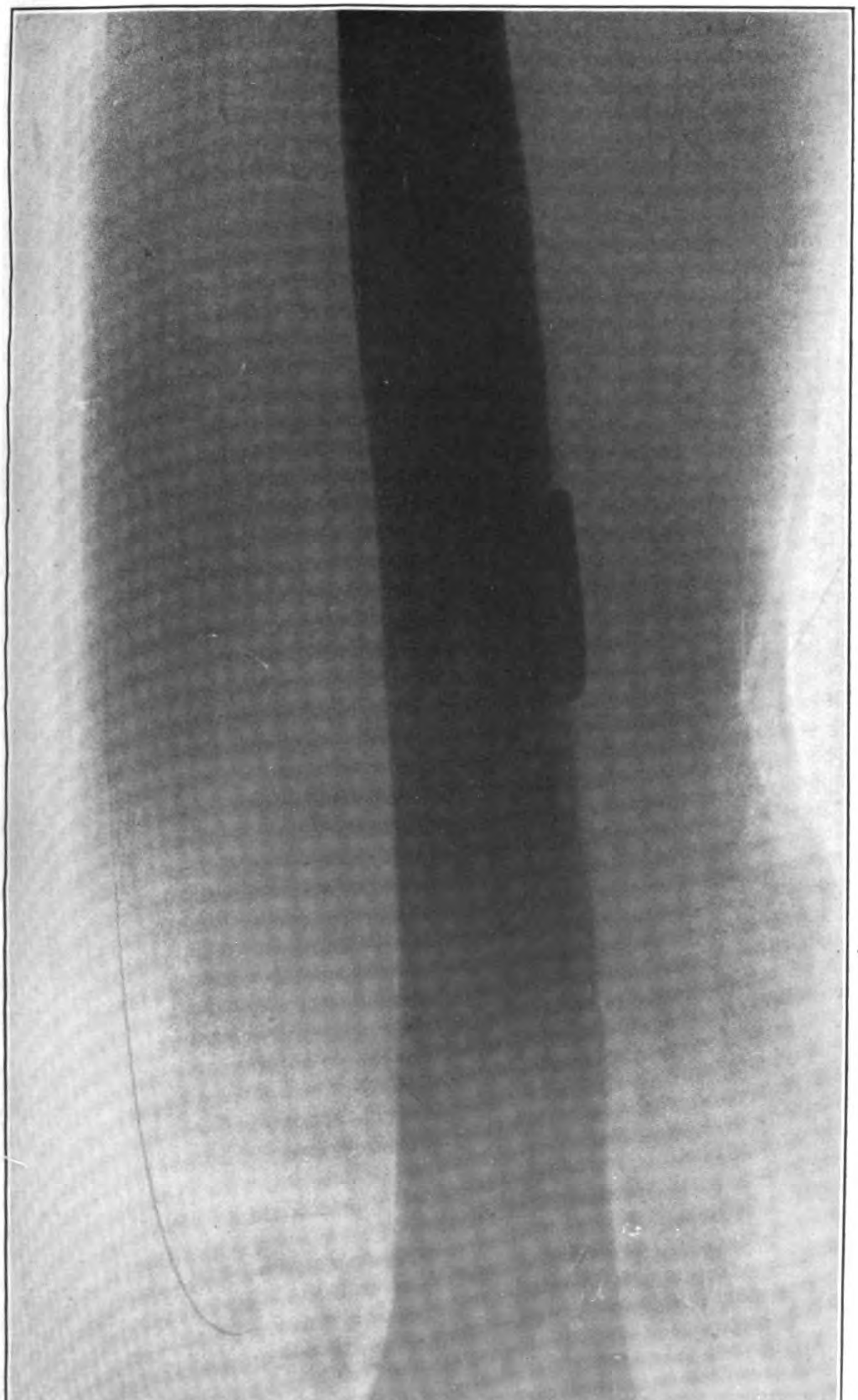
Case 16.—L. D. R., Sea. Gunshot wound of right shoulder. Bullet entered anteriorly, perforated the scapula and lodged beneath the skin. No injury to the structures about the joint and no infection.

Case 17.—H. N. N., B. M.-2. Gunshot wound of lower extremity. Perforating wound of left leg producing a compound fracture. On the third day patient was very septic, high temperature, rapid pulse and prostration. The subcutaneous tissues were emphysematous to a point slightly above the knee. The discharge from the wound was serosanguineous and had a very foul odor. Smear showed numerous Gram positive organisms with a centrally situated spore. Amputation at the junction of the upper and middle thirds of the thigh.

Case 18.—C. P. K., O. S. Gunshot wound of right leg. The right leg above the ankle was the seat of a compound fracture of both bones with great laceration of soft parts. On the third day patient was septic. Examination showed an emphysematous condition of the subcutaneous tissues as high as the knee. The discharge from the wound was serosanguineous and had a peculiarly offensive odor. Temperature was high, pulse intermittent and rapid, 120–130. Amputation at middle of the thigh.

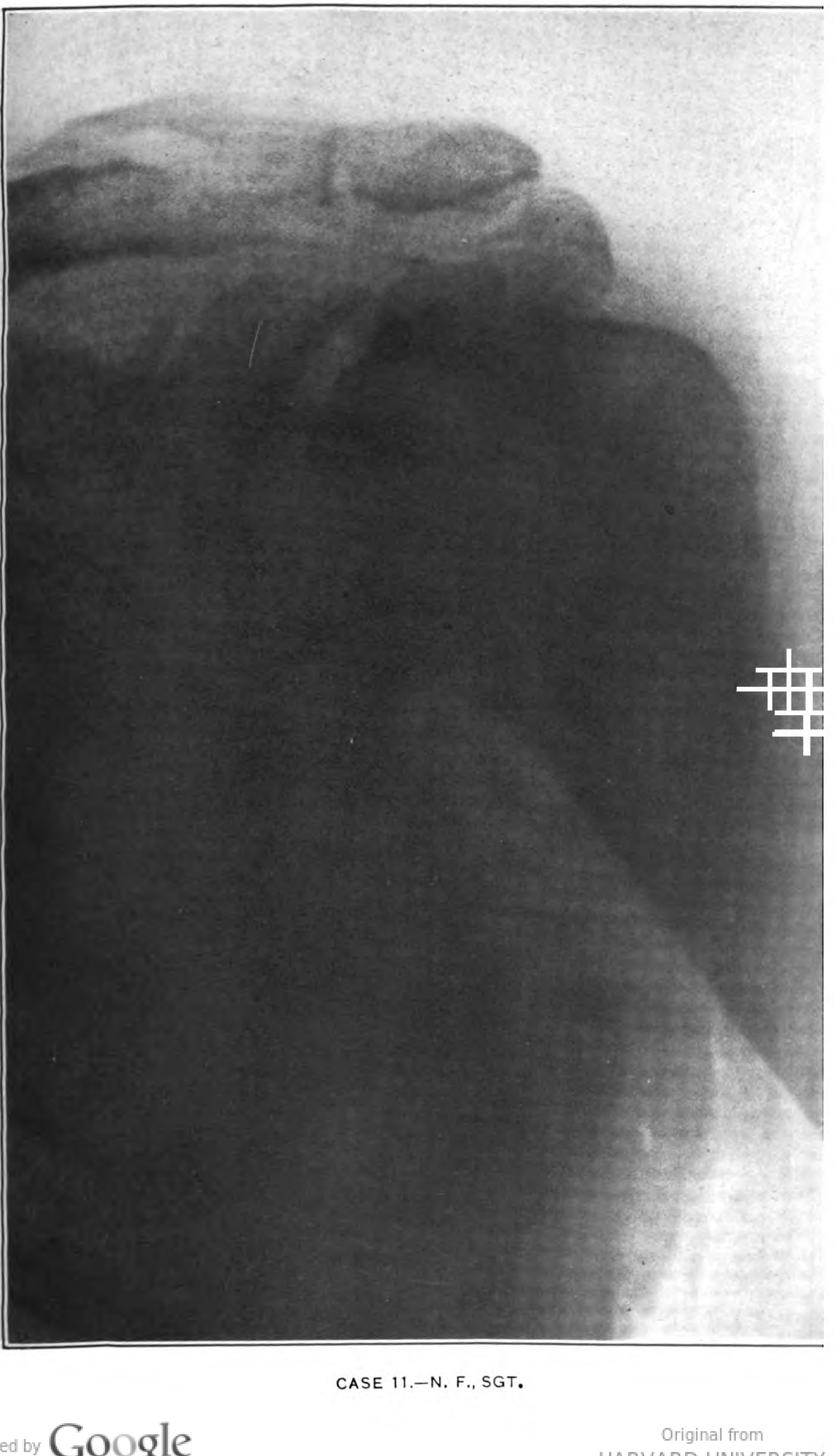
Case 19.—H. J. K., Sea. Perforating wound of right knee. Bullet entered above patella anteriorly and made its exit posteriorly, 3 inches below the knee. No infection. Prognosis as to function good.

Case 20.—C. R. H., Sea. Gunshot wound of right thigh. The bullet perforated both thighs, passing first through the muscles of the left then through the right, shattering the femur. Profuse hemorrhage arrested by pressure. Mild infection. External wound was enlarged sufficiently to insert drainage tubes. Did well until eighth day when there was a copious secondary hemorrhage. Hemorrhage arrested by pressure but recurred on the ninth day. Operation decided on to determine bleeding point. At operation large infil-



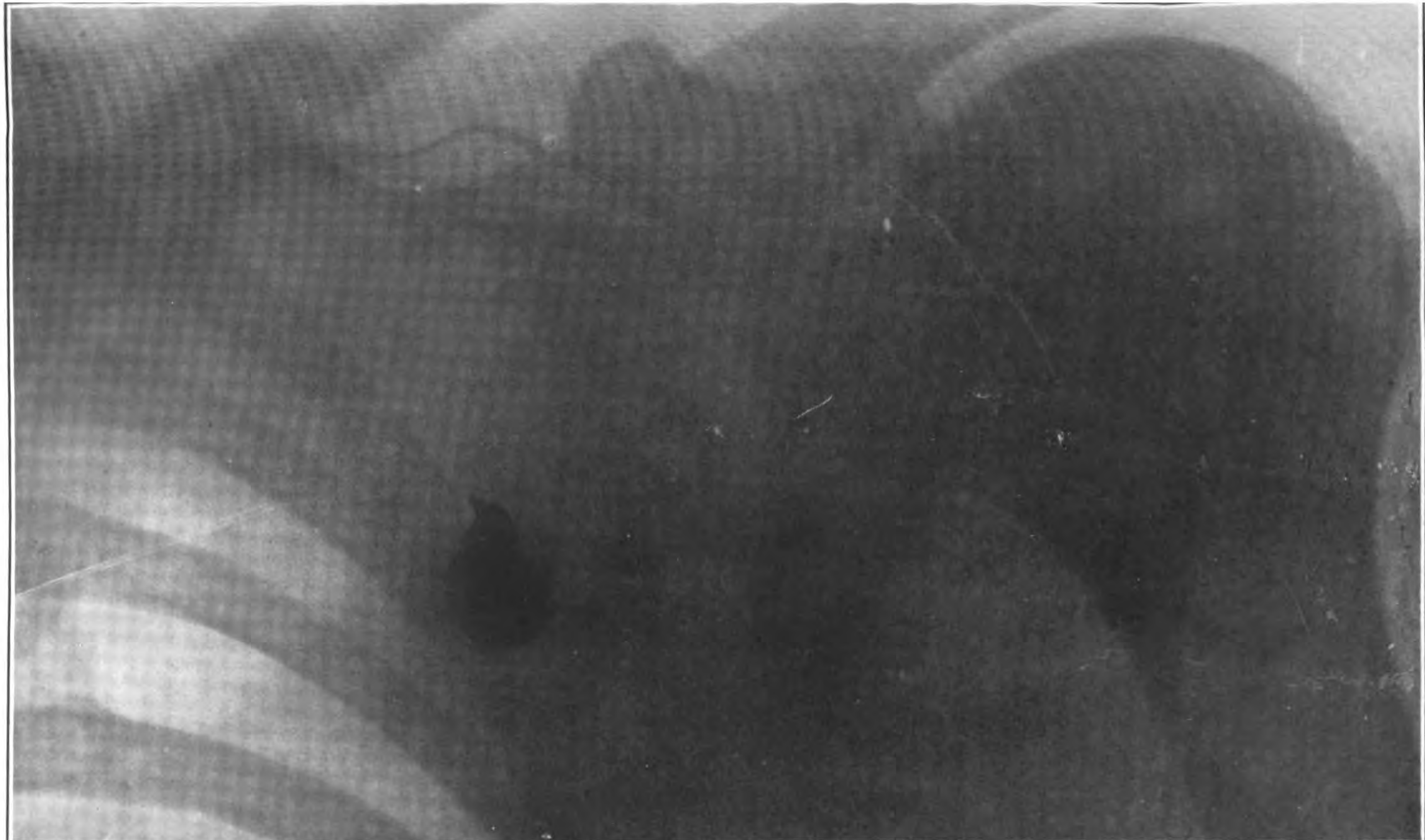
E. J. G. FLESH WOUND OF ARM, BULLET LYING ON HUMERUS.

CASE 3.—G. J. P., PVT.



CASE 11.—N. F., SGT.

CASE 15.—E. P. P., PVT.



CASE 16.—L. D. R., SEA.

CASE 26.—F. J. P., O. S.

trating hematoma, extensive destruction of soft tissues by secondary bone missiles. Amputation. Died.

Case 21.—E. A. G., El.-3. Gunshot wound of left knee. Bullet struck lower end of femur with explosive effect, causing extensive fragmentation of bone and destruction of soft parts. Amputation at middle of thigh.

Case 22.—H. F., O. S. Gunshot wound of right knee. Perforating, anteroposterior. No infection.

Case 23.—G. H. C., O. S. Gunshot wound of lower extremity. Bullet perforated soft parts posterior to right knee, injuring the external popliteal nerve, causing paralysis of extensor muscles. No infection.

Case 24.—J. C., civilian. Gunshot wound of buttocks. The bullet passed laterally through both buttocks, producing four wounds, two of exit and two of entrance. All of these wounds healed without infection.

Case 25.—M. B., civilian. Gunshot wound of lower extremity. Entrance upper third left thigh anteriorly. The bullet struck the femur with explosive effect, driving bone fragments through the posterior aspect of the thigh. Copious hemorrhage. Infection. On the third day anterior wound was enlarged sufficiently to remove some of the bone fragments and insert large drainage tubes. Wound discharged freely and he did well until the eighth day, when a profuse secondary hemorrhage occurred. Hemorrhage recurred several times and patient died on the fourteenth day. The proximity to the hip, the extensive destruction of bone and soft tissues, the hemorrhage, and infection made this case practically hopeless.

Case 26.—F. P., O. S. Gunshot wound of left knee. Penetrating wound. X ray showed fragment of metal in peri-articular tissue near patella. Joint was not opened. Fragment was portion of steel jacket and was removed under local anesthesia. No infection.

COMMENTS.

Most of the wounds were caused by the Mauser type of steel-jacketed bullet. Many were at ranges considerably under 600 yards and the explosive effect on long bones at such a range was well illustrated in several cases.

The general character of the wounds conformed to the well-recognized effects of the modern high-power rifle. A number of wounds were caused by small fragments of the steel jackets of the bullets. As the fighting was largely in the street, it is supposed that bullets striking the hard pavements exploded, with the result that the fragments of the jacket became secondary missles.

In many of the flesh wounds it was noted that either the wound of entrance or the wound of exit, or both, were ringed by an area of

greatly devitalized tissue. This usually sloughed off within 10 days and healing went on by granulation. This devitalization of tissue was particularly marked in long guttered wounds with laceration.

Three cases of late hemorrhage occurred; two in wounds of the thigh and one in a wound of the arm, the latter due to separation of the slough from a burn of the brachial artery.

There were three cases, as described above, of nerve injury.

The one wound of the skull coming under our observation bore out the well-known fact that without fracture, or, at most, a very slight injury to the outer table, extensive damage may result to the inner table or brain.

All observers agree that gunshot wounds of the spine are remarkably fatal, and the serious nature of such cases is augmented when there exist chest and abdominal injuries or hemorrhage.

Of the five cases of abdominal wounds, only two involved the peritoneum. Three cases had the wound of entrance in the hypogastric region and involved neither the bladder nor peritoneum.

Infection, except in the cases noted above, was mild in character. In the amputations infection of the stumps occurred. In two of these the bullet had entered above the line of amputation, necessitating incision through the track of the bullet. In the cases of gas infection, the extension of the ordinary pyogenic organisms by the lymphatics is a strong probability.

Eighteen, or 32 per cent of the cases, were wounds of the lower extremity, comprising two of the three fatal cases. Both of these were compound fractures of the thigh. In each case the bullet had struck the femur and produced extensive comminution, injuring soft parts and vessels by secondary missiles of bone. Certainly compound fractures of the thigh, associated as they frequently are with hemorrhage, infection, and the difficulties of transportation, will tax to the utmost the judgment and skill of the surgeon.

It is generally conceded that wounds of the chest do remarkably well, and the one serious case on the *Solace* bears out this opinion. On admission, the case appeared to be very grave, but went on to a rapid convalescence.

The knee joint was perforated in two cases. In neither was there infection, and impairment of function will probably not result.

TREATMENT.

When the cases were received on board the first-aid dressings were in nearly every instance admirably applied. These dressings were changed and all wounds examined. Wounds of exit and entrance were touched with tincture of iodine. The wounds of the knee were treated by occlusive dressings and fixation. The general management was along accepted lines of asepsis and antisepsis.

The location of wounds was as follows:

Head	6
Thorax	10
Abdomen	5
Upper extremity	16
Lower extremity	18
Total	55

CASE REPORTS FROM NAVAL HOSPITAL, PORTSMOUTH, N. H.

By F. M. Bogan, surgeon, United States Navy.

The case reports which follow are believed to be somewhat out of the general run of those met with in naval hospital practice.

A. Was attacked at midnight on a bridge about 2 miles from the navy yard. He was knocked down by a blow on the jaw, and while prostrate was stabbed 27 times with a knife. He was carried to the police station and eventually reached the hospital, four hours after the assault, unconscious and very feeble from loss of blood. First aid had not been given. The wounds were distributed as follows: Six of the head, two of the left ear, nine of the left arm and forearm, three of the left thigh, three of the left shoulder, and four of the back. The right temporal artery was severed and spurting. The left facial nerve at its exit on the face was partly severed and the left shoulder joint and the right pleura punctured.

The wounds were swabbed with tincture of iodine and sutured. Primary union followed in all. The patient made a good recovery and returned to duty.

An amusing feature of the trial of those charged with the assault was the plea of the defense that the man's life had not been endangered, hence the defendants were guilty of simple assault only.

B. While at drill, was accidentally shot by the marine standing directly beneath him, who was unloading his rifle. The charge was that used by the marine prison guards and contained nine large slugs. This charge entered the popliteal space, the direction being from above downward, causing one large wound about 8 by 4 inches and three lower and smaller wounds. The popliteal space, with nerves and vessels, was exposed; the upper two-thirds of the gastrocnemius muscle was destroyed, and there was extensive laceration of the soleus and other tissues. Shreds of clothing were removed from the deeper wounds. Despite the use of tincture of iodine, a severe infection followed.

At present there is a comparatively small, flexible scar, and the soleus muscle has developed sufficiently to prevent loss of function.

This patient has returned to duty and walks without a limp.

C. A baker, while at work on board ship, had his left hand caught in the dough mixer and ground into pulp. The superficial and deep palmar arches were destroyed. Very little palmar tissue could be utilized in forming a flap. Disarticulation at the wrist was performed and the patient now has a good stump. This is the second accident of this kind I have seen in the Navy.

D. A masonry wall, about 2 feet thick and 20 feet high, collapsed and the patient, standing on the ground, was buried under the pile of stone. He was a mass of cuts and bruises and had sustained a fracture of the outer table of the skull, a scalp wound 8 inches long over the vertex, and one 3 inches long over the forehead. There was also a compound fracture of both bones of left leg above the ankle and a fracture of the femur of the same leg in the lower third.

Buck's extension apparatus was applied to the leg with a posterior splint. All wounds were swabbed with tincture of iodine and healed promptly. The patient left the hospital with no apparent ill results.

E. A prisoner, while at work in the laundry, had his right arm caught in the moisture extractor, which was making several thousand revolutions a minute. There was a complete dislocation at the elbow and the humerus from the elbow to the shoulder was denuded of all soft parts. The brachial artery was lacerated. Amputation was performed with prompt recovery.

F. A private marine, very much under the influence of liquor, fell several times from the driver's seat of a wagon to the ground; just how many times he fell is not known. After stabling the horse he walked to the prison and turned in. About five hours later he reported at the sick quarters, saying he was passing bloody urine. A diagnosis of ruptured kidney was made and the advisability of immediate operation was considered and rejected.

Treatment was absolute rest, strapping side, morphine, ice bag to loin, hot water to feet. The urine, at first bright red, gradually changed to smoky with long worm-like clots, and about two weeks after the accident (October 15) had become clear.

At this time there was a well-defined tumor, below the lower border of the liver, suggestive of misplaced kidney; the temperature ran from 100° to 101° F. each evening. In spite of the gloomy prognostications of some of the consultants and with no encouragement from textbooks the patient was nursed along.

On October 25, while reaching for something, patient had sudden pain in side, tumor disappeared, and he again began to pass bloody urine.

A careful investigation into the patient's previous history by Dr. L. H. Wheeler disclosed the fact that he was a hemophiliac. The usual treatment was again started, and, in addition, calcium lactate 1 gram every four hours, was given. By November 5 urine was again

clear. On November 6 there was a return of hematuria, with pain in loin and rigidity of abdominal muscles, and during the next two weeks there were two other attacks which were temporarily relieved by morphine. By December 1 the patient was up and walking around the ward, and up to March 1 there has been no return of the hematuria.

This has been a most instructive case. First of all, the writer believes that had the patient been taken to an emergency hospital in any city he would have almost certainly been operated on, and would now be occupying a cozy little corner in some graveyard.

Second, if calcium is given, much larger doses should be administered than are usually recommended. No ill effects were noted, though the calcium lactate was continued in 3-gram daily doses for six weeks. In this case it had a pronounced and beneficial effect.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

A. W. DUNBAR, surgeon, and G. B. CROW, passed assistant surgeon, United States Navy.

IVY, R. H. **The mouth in the etiology and symptomatology of general systematic disturbances.** Dental Review, Jan., 1914.

Ivy calls attention to the faulty education of the dentist in general disease processes and pathology and of the physician in local lesions of the mouth, jaws, and associated parts. As evidence of the crude ideas of dental pathology held by eminent teachers in medicine he quotes the following from a leading work on surgery of the present day: "Alveolar abscess has as its starting point a carious spot about the fang of a tooth."

Practically all infections of the body, barring injury or venereal disease, must gain entrance in the first place by way of the oral cavity, and the commonest of the mouth infections to show its effects upon general body structures is pyorrhea alveolaris. Continued swallowing of pus and bacteria causes functional and later anatomical changes along the alimentary canal. Every case of chronic dyspepsia should have the benefit of thorough mouth examination and treatment in order to rule out pyorrhea or other oral infection as a cause. Absorption of bacteria and their products may produce severe forms of anemia, and Ivy describes several interesting cases as illustrations of this fact. Many cases of acute rheumatism and arthropathies of obscure origin may also be caused by such infection.

Infectious foci in the mouth may be important factors in the etiology of pneumonia, particularly inhalation pneumonia following anesthesia, and careful examination and cleaning of the mouth before general anesthesia should never be neglected. Many cases of tuberculous cervical adenitis are undoubtedly infected through decayed teeth, and tubercle bacilli have been found in the decayed teeth of such cases.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

Statistique médicale de la marine, 1909.

Typhoid: Four cases appeared on the *Liberté* after returning from New York. Bacterial analysis of the distilled water showed the presence of the *Bacillus typhosus* and it is probable that the tanks

were infected during cleaning. There were many cases of typhoid in New York during the time of the ship's stay at that port and the supposedly potable water furnished to the ship was shown by analysis to contain decomposed organic matter, also *Bacillus coli* and *Bacillus pyocyaneus*. It is reasonable to suppose that, in spite of repeated warnings, the men imprudently used this water for drinking purposes.

The great majority of typhoid cases in the fleet in France was not contracted on board the ships. The infections were due to the use of contaminated water, particularly at Cherbourg, where the city water contained *Bacillus typhosus*, and a severe epidemic was in progress in the city. At Toulon typhoid existed in endemic state and constituted not only a grave danger to the Navy, but an international menace.

Tuberculosis: The incidence fluctuates from year to year, but the general trend is downward. Many cases are found in young apprentices recently admitted to the service and the medical officers of the school ships are demanding a stricter selection.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.

LEISHMAN, W. **Antityphoid inoculation. Journ. Royal Army Med. Corps.**

A strain of low virulency is employed in the British service. It is believed that a weak strain affords an equal degree of immunity and one of equal duration, to that conferred by a more virulent strain. The power of affording immunity appears to be more a peculiarity of certain strains rather than to be dependent upon virulence.

Theory supports the use of a polyvalent vaccine, but experience fails to afford conviction that the results would be any better than those given by the monovalent vaccine in use.

Were the converse true the incidence of typhoid fever among the inoculated would show a lack of uniformity in various widely separated localities, as Egypt, South Africa, and India, which is not a fact.

It has been argued that the febrile reaction following inoculation is caused by the peptone bouillon medium, but the substitution of a culture grown on agar has shown no improvement in this respect. Nor is it yet proven that it is possible to separate the toxic from the immunizing element without sacrificing the latter.

Sterilization of the vaccine by heat is employed, but the degree of heat used is important as, if too high, it impairs the immunizing properties.

The standardization of the vaccine and regulation of the dosage by enumeration of the bacteria present in a given volume is suffi-

ciently accurate, as is shown by the uniformity of the reactions obtained. Some persons exhibit a hypersensibilty to the vaccine. Analytical blood tests might detect these cases, but as a routine measure are impracticable. Hypersensitiveness appears to show an inability to produce immunity on the part of the individual.

The keeping properties of the vaccine have been carefully observed, and it has been found that if kept in hermetically sealed containers in the dark, and at a temperature not in excess of that of the shade in any climate, its efficacy is not impaired for several months. In the Tropics little if any change could be detected after six months' storage, but as a matter of precaution it should not be kept under these conditions for ever three months.

The dosage employed is two injections of 500 million and 1,000 million, respectively, at an interval of 10 days. This limitation to two doses is, in the British service, based upon policy and lack of evidence to show any advantage in a greater number of doses.

The duration of the immunity is difficult to determine owing to the constant change in the personnel of the organizations, rendering it impossible to compare statistically the typhoid rate of an inoculated command and that of an immunized organization for a number of years under the same environment.

Leishman is of the opinion, based upon such information as is now afforded, that in the great majority of cases little or no immunity is afforded after two years, and that after the expiration of this time a single dose of 1,000 million should be given, but admits as regards this dosage a lack of information.

It is not believed that there is any increased susceptibility to typhoid immediately following inoculation. It may occur that the vaccine is administered to an individual already infected, but such cases have not run an unusually severe course. Confirmative of this opinion is the increasing use of typhoid vaccine in the treatment of typhoid fever with nothing but good results.

Antityphoid inoculation does not protect against paratyphoid infection, and efforts are now being made to produce a mixed vaccine to protect against both diseases.—(A. W. D.)

HORDER, T. J. **Vaccines from the standpoint of the physician.** Proc. of the Royal Coll. of Phys.

The physician is a better judge of the results of this form of treatment than is the bacteriologist. The increasing employment of vaccine therapy is, alone, not a proof of the efficacy of this treatment, being in large measure forced upon the practitioner by the public.

Stock vaccines are demanded by those whose means do not permit the expense of securing an autogenous vaccine, and also by those cases where no material for the vaccine is obtainable. The uncertainty of diagnosis in these cases naturally leads to the use of a polyvalent vaccine.

The use of the endotoxins of several different microorganisms under the name of phylacogens, while open to discussion, is an evidence that many physicians feel that something should be injected into their patients, but that beyond this they are not prepared to go, and also shows that the fear of the introduction of microbic poisons has largely disappeared.

The curative effect of vaccine therapy should be based almost entirely upon the effect of autogenous vaccines. Stock vaccines and phylacogens are to be regarded as "gambles of science." Too much must not be expected, vaccine treatment has its limitations: nor must the mechanical advantages of drainage be neglected. The dose must be adequate and a too strict adherence to any rigid scheme must be avoided.

The failures of vaccine therapy are probably more numerous than its successes, but "it is a weapon of enormous value in the war we wage upon the causes of infective disease." The measure of success is in direct proportion to the care and judgment bestowed on the diagnosis.

Horder expects some result whether the condition is acute, chronic, localized, or general, provided the case is one of an infective nature and the causative organism can be isolated. The pathogenicity of the organism should be established not only by its biochemical character, but also by blood tests, experimentation on animals, and consideration of the pathological conditions present.

In regard to dosage the graduated system is the favorite in chronic infections, commencing with a subminimal dose and carried beyond the dose which causes some ill effect.

In chronic infections with a tendency to recur, as furunculosis, the dosage should be gradually decreased after the maximum is reached.

In acute infections the "steppage" system is preferred, three increasing doses being given at short intervals for one to two days, then an interval, this followed by a second or third series, the initial dose of each being the intermediate dose of the preceding series.

In chronic cases 7 to 10 days are allowed between doses.

During the administration of vaccine treatment every effort should be made to improve the patient's general condition.—(A. W. D.)

DERCUM, F. X. **The treatment of sciatica.** Therapeutic Gazette, April 15, 1914.

The point of prime importance preliminary to the treatment of sciatica is the diagnosis. In Dercum's experience most cases of true sciatica respond well to treatment, and in any case that does not respond to treatment the probabilities are that the symptoms are due to trouble elsewhere. Conditions that may give rise to pain in the sciatic distribution include lesions of the sacral plexus and cauda equina, lesions of the bones or other tissues in relation to the above structures, tumors within the pelvis, and disease of the pelvic viscera.

Dercum has tried a number of remedies; turpentine, arsenic, quinine, the iodides, antipyrin, phenacetin, burning the skin with the Paquelin cautery, and also has had some cases subjected to the operation of exposure and stretching of the nerve. He now relies upon the following: Rest and the administration of the salicylates and bromide. Merely resting in bed, allowing the patient to assume the position that is most comfortable, has succeeded in the greater number of cases, although in a few the application of a long splint to secure fixation is necessary. Medication is carried out as follows: Ten to 20 grains of sodium salicylate, together with 20 to 30 grains of sodium bromide, must be given every 4 hours. It is important to give these large doses for 24 or 48 hours, at the end of which time the pain is generally greatly lessened or perhaps has disappeared, when the dose may be reduced one-half and then rapidly discontinued. In order to prevent contractures, movements of the leg should be practiced after the acute pain has subsided. Massage and electricity are of value in maintaining nutrition during the period of prolonged rest. Various local forms of treatment are still recommended by others, more especially the injection or infiltration of the tissues about the nerve with such substances as sodium chloride, eucaine, stovaine, and suprarenin hydrochloride; but Dercum believes that such procedures are rarely if ever indicated. He states, however, that should he fail with the measures he is at present employing he would give a trial to infiltration with common salt solution.—(G. B. C.)

MACCARTY, W. C., AND BRODERS, A. C. **Chronic gastric ulcer and its relation to gastric carcinoma.** Arch. Int. Med., Feb. 15, 1914.

The writers believe that the discussion that is now going on in the literature over the question as to whether or not gastric carcinoma develops on chronic gastric ulcer and the percentage of chronic ulcers which becomes carcinomatous is a discussion not only dealing with an unanswerable question, with our present methods of investigation,

but doing a great deal of unnecessary harm by preventing rational treatment. They give the findings in 684 specimens which were either excised or resected from the stomach at the Mayo clinic. Of these 191 were chronic ulcers or ulcers in which no histologic evidence of carcinoma was present. There were 472 specimens which presented the characteristics of simple ulcer plus the presence of carcinoma, and there were 21 specimens of ulcer in which the diagnosis of cancer was doubtful. Without regard to the clinical history of these cases they draw the following conclusions from the pathological findings:

1. Single and multiple chronic ulcers occur in the stomach.
2. Single and multiple chronic gastric ulcers occur with all the characteristics of simple ulcers, plus the presence of carcinomatous cells in their borders, minus the presence of similar cells in the base.
3. Single and multiple gastric ulcers occur which present the macroscopic characteristics of simple ulcer plus the presence of carcinoma in the borders and bases and with glandular involvement and metastases.

The association of these two conditions should lead every physician to consider the possibility of chronic gastric ulcers not only becoming but actually being carcinomatous. The clinical history, gastric analysis, roentgenoscopy, and serum diagnosis can not positively differentiate these groups of cases, especially those without pyloric obstruction. "Indeed, the microscope, which is our present highest court of appeal, can do no more than to divide the specimens into three groups, namely, simple ulcer, carcinoma group, and doubtful group. Whenever the clinician feels positive of the clinical diagnosis of chronic gastric ulcer he should consider that carcinoma can not be ruled out by our present methods of clinical investigation."—(G. B. C.)

FOLIN, O., DENIS, W., AND SEYMOUR, M. **The nonprotein nitrogenous constituents of the blood in chronic vascular nephritis (arteriosclerosis) as influenced by the level of protein metabolism.** Arch. Int. Med., Feb. 15, 1914.

Folin and Denis recently introduced a technique which greatly simplifies the study of the nitrogenous waste products of the blood. Such studies are of particular value in nephritis, for urine analyses can not show the degree of accumulation of such products, an accumulation which may vary between almost normal figures and those accompanying uremia. According to Strauss, the high blood pressure of nephritis is frequently accompanied by an excessive accumulation of nitrogenous waste products in the blood, whereas edema is associated with a retention of chlorids.

The authors state that the chief purpose of the present investigation was to determine the extent to which it is possible by means of diets to vary the waste nitrogen in the blood of such nephritis and incidentally determine whether there is any relationship between the blood pressure and the accumulations of nitrogenous waste products in the blood. They also included a series of "kidney efficiency" tests, according to the phenolsulphonephthalein method of Rowntree and Geraghty, in order to obtain a comparison between the values given by that test and the actual accumulation as revealed by blood analyses. The 12 subjects of these experiments, inmates of a Boston city institution, were selected mainly on the basis of abnormally high blood pressures (160 to 225 mm.). In all of these cases there was a diagnosis of chronic interstitial nephritis and arteriosclerosis and in several some cardiac change was noted.

It was originally intended to divide the time covered by the experiment into three periods: (1) A period in which the patients would be allowed to eat at will the ordinary ward diet; (2) a period of high protein feeding; (3) a period of low protein feeding but with a high caloric intake made up from carbohydrates and a small amount of fat. The diets proposed for the first and third periods were successfully administered, but during the period of high protein feeding nausea and vomiting occurred in many of the cases, and they were therefore unable to raise the protein metabolism to a very high level.

Their results were as follows:

Regarding the effect of diet upon the amount of urea and nonprotein nitrogen in the blood, they found that in every case the figures at the end of the low-protein period were down to the figures obtained in normal individuals (from 22 to 28 mg. nonprotein nitrogen and from 11 to 14 mg. urea nitrogen), and these were in most cases about half the amounts found at the end of the period of ward diet. The figures at the end of the high-protein period were in most of the cases substantially the same as those obtained at the end of the ward-diet period, i. e., the patients were unable to metabolize a greater amount of protein than was contained in the ward diet and the ingestion of an excessive amount soon produced nausea and vomiting.

Regarding the effect of nitrogen retention upon blood pressure, they found little or no connection between the blood pressure and the degree of nitrogen retention, and believe, therefore, that a high blood pressure does not necessarily indicate the desirability of introducing low-nitrogen diets in nephritis. It would appear that the only criterion now available for regulating the protein content of the food in nephritis is the determination of the amount of retention by blood analysis.

Concerning the phenolsulphonephthalein test for kidney efficiency they found no correspondence between the results of this test and the degree of nitrogen retention. They conclude from these results that the direct determination of the nonprotein nitrogen (and urea) in the blood furnishes a more reliable guide to what might be called the protein tolerance of patients than can be obtained by any direct test of kidney efficiency, for of all tests yet devised for this purpose the phenolsulphonephthalein test of Rowntree and Geraghty is admittedly the best.—(G. B. C.)

Odie, E. L., and Alford, L. B. **The influence of diet on hepatic necrosis and toxicity of chloroform.** Journ. Amer. Med. Assoc., Mar. 21, 1914.

The destructive action of chloroform on the cells of the liver has long been recognized. Chloroform given in sufficient quantity to animals by stomach or by inhalation produces a necrosis involving the center of the liver lobules and extending four-fifths of the distance from the central vein to the periphery of the lobule. The parenchymatous cells of other organs show no such change. The same change is found in man in the cases of delayed chloroform poisoning that occasionally follow anesthesia. Before death, in addition to certain nervous symptoms, jaundice appears and increases in severity. Crystals of tyrosin and leucin may appear in the urine and suggest disintegration of hepatic tissue. After death the liver is found enlarged and there is an advanced necrosis beginning in the centers of the lobules.

Howlands and Richards, reproducing delayed chloroform poisoning in dogs, have shown that necrosis of the liver is associated with the increased elimination of sulphur and nitrogen which accompanies intense disintegration of body protein.

Opie and Alford undertook to determine whether the disintegration of hepatic cells as a result of chloroform poisoning might be modified by diet. Preliminary experiments showed that the fatal dose of chloroform for white rats could be determined fairly accurately and these animals were used in the experiment. Some of the animals were fed for a few days on carbohydrates, some on meat, and some on fats, and all were then given the previously-determined fatal dose of chloroform. Animals which received carbohydrates survived, whereas all of those which received meat and fat died. They repeated the experiment, except this time, instead of giving the fatal dose of chloroform as determined for normal animals, they gave varying amounts of chloroform to animals in each of the three diet groups in order to determine the fatal dose for each group. The results are extremely interesting. Three times the fatal dose for animals receiving fat was survived by animals receiving meat.

whereas, five times this dose was survived by animals which had been fed on starch and sugar. Attention is called to the observations of those (as Shaffer and Coleman for typhoid fever) who have shown that carbohydrates prevent the disintegration of body proteins. Advanced necrosis of the liver was found in those animals which died after receiving meat and fat and serves as an index of the severity of the intoxication. As animals on a pure fat diet had shown a loss of body weight the experiment was repeated by adding fat to a carbohydrate diet. The average body weight on this diet was slightly increased. Chloroform was now given. The average duration of life was somewhat greater than it had been in the animals on fat alone diet. Two animals survived. This is taken as indicating the protective action of the carbohydrates, but at the same time the dangerous influence of fats is shown.

They conclude that fat administered to animals and presumably stored in part in the liver increases the susceptibility of the organ to the injurious action of chloroform. In view of the well-known solubility and diffusibility of fats in chloroform they suggest that the fat in the liver cell determines the fixation of chloroform and the occurrence of necrosis. They believe that carbohydrates protect the body proteins from disintegration. " Since necrosis of the liver, with a variety of conditions in man, namely, toxemia of pregnancy, actue yellow atrophy of the liver, yellow liver, and poisoning from a variety of substances, exhibits close similarity to the necrosis of chloroform, the foregoing experiments suggest that a carbohydrate diet may be found to influence favorably the course of these diseases, whereas fat may have grave danger."—(G. B. C.)

ASHHURST, A. P. C., AND JOHN, R. L. **The rational treatment of tetanus.** Episcopal Hosp. Reports (Philadelphia), Vol. I, 1913.

This is a very exhaustive article. The authors give a very complete discussion of the literature and of the rationale of treatment. They report 23 cases which they treated personally or saw in consultion, and they give their final conclusions as to the best procedure in the treatment of these cases. This procedure is somewhat as follows:

First, remove the source which supplies the toxin. If the point of inoculation is known it should be opened widely and mechanically cleansed of foreign bodies and sloughs. It should then be swabbed out with 3 per cent alcoholic solution of iodine, rinsed with hydrogen peroxide, and loosely packed with gauze wet with the iodin solution. The wound should be dressed daily in this manner until healthy

granulations appear. All caustics should be avoided, as favoring the growth of tetanus bacilli by the formation of sloughs.

Second, head off and neutralize the toxins already formed. This involves the use of antitoxin. Inject 1,500 to 3,000 c. c. of antitoxin deeply into the muscular tissues about the wound. As soon as possible after the case comes under observation the motor nerves leading from the wound should be exposed as near the cord as possible and as much antitoxin as each will contain injected within the sheath and in the direction of the spinal cord. An intraspinal injection of at least 3,000 units should then be made according to the usual technique for spinal anesthesia. Intraneural and intraspinal injections should be repeated daily under chloroform anesthesia until marked decrease in spasticity occurs. Every 12 hours a moderate amount of antitoxin (15,000 to 25,000 units) should be given intravenously, or even subcutaneously, to neutralize the circulating toxins, but the main reliance should be placed on the intraneural and intraspinal injections. There is strong experimental evidence that the toxin travels to the central nervous system chiefly along the nerve trunks, and attempts to neutralize the toxin by subcutaneous injections are almost a complete waste of time and expensive material.

Third, depress the functions of the spinal cord. Chloral, gr. 2 to 3, and bromide, gr. 5 to 6 should be given as often as necessary to control symptoms; a comatose state or muscular relaxation are contraindications. Morphine is considered less effective than chloral and bromide, and the intraspinal injection of magnesium sulphate is believed to be too dangerous.

Fourth, treat the patient as well as the disease. Isolation is desirable rather for the sake of protecting the patient from noise than for the purpose of preventing contamination of other patients, which is very rare. Seek as far as possible to shut out all sensory stimuli which tend to excite convulsions. Watch for retention of urine. Keep the bowels open; when the disease is fully established constipation may be relieved with difficulty. Food must be given at all hazards, by a nasal tube if necessary, even if the tube has to be passed under chloroform anesthesia.

Ashford and John believe that with the above treatment, commenced within 12 hours of the appearance of symptoms, the mortality of tetanus should not be over 20 per cent.—(G. B. C.)

JANEWAY, T. C. **The comparative value of cardiac remedies.** Arch. Int. Med., Mar. 15, 1914.

Janeway discusses in his usual thorough manner the comparative value of various remedies in the several cardiac and many of the

circulatory derangements. Only a few of these conditions can be considered here.

Since the time of Withering every intelligent physician has recognized the clinical picture of the insufficient heart, with chronic passive congestion of the viscera and edema, as the strictest indication for the use of digitalis or its allies. Lewis proved 10 years ago that the so-called delirium cordis, the pulsus irregularis perpetuis, the nodal rythm of Mackenzie, are the ventricular manifestations of fibrillation of the auricles. He has also proven that the slowing and steadying of the ventricles under digitalis is due to the action on the conducting tissues of the heart with the production of heart block. Janeway does not maintain that in auricular fibrillation the sole benefit to the ventricles is due to the reduction in rate, but that is the demonstrable and the principal effect. The more completely a given circulatory disturbance is dependent upon a rapid rate which can be controlled by digitalis the more brilliant is the therapeutic effect of the drug. In Janeway's opinion the best example of this is not the extreme cardiac insufficiency with marked passive congestion after long standing auricular fibrillation in mitral disease, but cases of previously well-compensated mitral disease in which auricular fibrillation with great tachycardia sets in acutely. In cases of advanced mitral disease, while the rate may be as easily controlled, secondary changes in lungs, liver, and kidneys already exist, and the extent of the valvular defect is so great as to preclude the reestablishment of even fairly efficient circulation after the rate has been brought to normal. In chronic cases the more nearly a given case approaches the acute type described the more promptly does the control of the tachycardia by digitalis effect a restitution of function. If the rate is normal or slow the effect of digitalis may not be manifest for a week or more, and if there be marked tricuspid regurgitation and liver stasis it may fail entirely. In some of these cases it is probable that failure is due to lack of absorption of the drug given by mouth. In this type of case Janeway has found the extreme fluid and salt restriction of the Karell diet of the greatest value as an accessory measure. In these cases of extreme tricuspid regurgitation with pulsating livers strophanthin intravenously seems the ideal remedy. Janeway has had such good results from digitalis following the Karell diet that he has been backward in using strophanthin, but the excellent results obtained with it by Fraenkel, Schwartz, and others incline him to use it more frequently. Strophanthin must not follow recent digitalis treatment, for its summation on a small amount of digitalis already fixed in the heart may prove fatal. In urgent cases where portal stasis prevents the absorption of digitalis venesection is a valuable aid. Hatcher and Bailey have proved that the crystalline g-strophanthin of Thoms, or ouabain, is most certain,

and has twice the strength of the amorphous preparation of Merck. The dose should not exceed 0.5 mg. in 24 hours and should not be repeated without careful observation of its effects.

The choice of a preparation of digitalis is largely a matter of taste. Given good leaves, Janeway prefers the infusion: in the absence of good leaves he advocates digipuratum as a uniform and efficient preparation, even after it has been kept for some time. As to dosage he has not found the large doses used by Mackenzie and Cushny to be necessary. He prefers the equivalent of not over 1½ gr. of the leaves every four hours, which will give definite slowing of the pulse and diuresis in 48 hours in rapidly fibrillating cases. This dose is continued until the pulse falls to near 60 or becomes bigeminal; failing this, until absorption of edema is complete. or nausea, vomiting, headache, or other toxic symptoms ensue. A most important evidence of favorable action, which James has made use of in the wards of the Presbyterian Hospital, is the graphic record of a simultaneously recorded heart rate and radial pulse rate. In rapid fibrillating hearts the difference, which is called pulse deficit, is usually great; but with the digitalis slowing, the two curves approach each other and may correspond. When any of these evidences of full therapeutic action is obtained, the drug is stopped and not resumed until increasing rate or pulse deficit, or disappearance of coupled beats, shows the heart to be escaping from its influence, which usually occurs in 5 to 10 days. Then one-half to three-quarters of the amount given before will control all symptoms. In all fibrillating cases with a tendency to rapid rate after the original digitalis course, the indications for continued, so-called chronic digitalis treatment are absolute. The efficiency of such hearts depends upon the maintenance of a normal rate. A normal rate can be maintained by perpetuating the right degree of digitalis block.

Failure to obtain satisfactory results in the class of cases just discussed is evidence of an inefficient preparation, insufficient dosage, or an improper mode of administration. Whenever digitalis fails, a second and then a third trial should be made with a drug obtained from another source. The need for employing the accessory measures referred to is urged for some cases.—(G. B. C.)

PSYCHIATRY.

R. F. SHEEHAN, passed assistant surgeon, United States Navy.

BRESLER, J. **Abderhalden's method.** Journal of Mental Science, April, 1914.

In at least 30 or 40 German psychiatric clinics and asylums trials are being made with this method, and perhaps as many treatises on the practicableness of this method for the diagnosis of some mental

diseases have been published. The method is too complicated to be learned by description, and it is advisable to learn it in a laboratory where it is practised. The sera of bodily and mentally healthy people, of constitutionally psychopathic persons, and of manic-depressive patients are free from protective ferments. In dementia precox destruction of the cortex cerebri and the sexual organs (testes and ovaries) is nearly constantly found, sometimes of the thyroid and seldom of the suprarenal glands. In paralytic dementia there is destruction of the cortex cerebri, but no destruction of the thyroid glands or sexual organs. In mental disorders caused by thyroid disease destruction of the thyroid gland is found. It is an important fact that by the Abderhalden method it is possible to distinguish dementia precox from manic-depressive insanity and from constitutional psychopathic states of mind. Dementia precox thereby is proved to be a form of insanity caused by morbid anatomical and chemical changes in the brain. In epilepsy also destruction of the cortex cerebri was found. The Abderhalden method, therefore, is of the greatest importance to psychiatry.—(R. F. S.)

REGIS, E. **Précis de psychiatre.** 5^me édition.

The latest edition of this well-known textbook states that it would be impossible to eliminate from the Army and Navy psychical degenerates as well as physical degenerates. The mental state should be studied by the examining board at the time of enlistment and also during active service. A very common mental disease among officers is general paralysis. One may also observe traumatic and alcoholic psychoses, maniacal and melancholic states, and systematized delirium. Thus among soldiers we find all the psychopathic disorders, such as alcoholism, systematized delirium, maniacal and melancholic states, epilepsy, nostalgia, epidemic suicide, etc., but degeneracy prevails, with or without delirium. Such degeneracy is either simple (unstable, old and eccentric people, feeble-minded, imbecile, and idiot) or congenital (neuropathological or psychopathical manifestations). Amongst abnormal soldiers, pathological fugue is most frequent (illegal absence or desertion). Consequently, when a soldier runs away it is necessary carefully to study his mental condition. In all cases the medical expert must observe, ponder, and wait before deciding upon responsibility or simulation.—(R. F. S.)

BOWERS, P. E. **Constitutional immorality.** International Clinics, vol. 4, series 23, 1913.

In an article under this title, which term is taken from Tanzi's Textbook of Mental Diseases, 1909, the author, who was formerly on

the staff of the Government Hospital for the Insane, takes up a subject which of late has provoked considerable discussion, even among the laity, as evidenced by its quotation in the Literary Digest of April 18, 1914. This question is of vast interest to the military service, as the delinquent of this type is prone to enlist, and if successful in doing so invariably becomes a court-martial offender or an inmate of an insane hospital, thereby causing expense, trouble, and possibly a lasting obligation to the service.

He states that "morality and character are functions of the brain, like memory or imagination and the moral sense, while the last of the psychic functions to be developed, is the first to be confused or disordered by mental disease." A multiplicity of terms has been applied to these disorders, such as "moral insanity" or "moral imbecility." Also that a vast amount of clinical material is being wasted in our penal institutions because of a lack of attention by well-qualified investigators to the problem of "constitutional immorality." The idea that some individuals are immoral because of some constitutional deficit of the neural organism is most repugnant, as it seems to challenge the traditional belief in man's free will, and this is especially true of those unfamiliar with mental disease. Yet we who have the care of delinquent individuals know that there are those who can not refrain from crime because of their degenerate organizations, which predispose and impel them to immoral acts. Different from the accidental or occasional criminals who regain their standing in civil life after their incidental deviation, the constitutionally immoral serve sentence after sentence, are paroled again and again into the best of environments, but they can not be kept out of prisons, toward which they gravitate, irresistibly drawn to them by inherent defects in their constitution.

"These unfortunate moral defectives we generally find to be burdened with an evil heredity, a hard unrelenting tyranny of ancestral defects. Many of them are ignorant and do not rise above the level of the feeble-minded; in marked contrast, others are highly educated persons who assent to general propositions concerning right and wrong and frequently delight to discuss moral customs and laws in order to exploit their casuistic and argumentative powers; but to them the concrete application of moral or legal restraint is a hardship which they can not understand."

He believes that these persons suffer from defects of three kinds—of the intellect, the will, or the emotions. There is a "disequilibration" of these functions of the mentality which leads to immorality. Those who have intellectual defects ranging from imbecility or moronity fail to understand their moral or legal obligations to others. Those with defects of volition know right from wrong, but can not suppress or restrain their inclination to crime. Those with

emotional defects are either prone to anger, hatred, jealousy, etc., or emotionally retarded with an indifferent paucity of ethical sentiments.

Dr. Bowers does not advise regarding these persons as criminals, but does not classify them as insane and believes they should be segregated permanently. Further, the specific treatment of the constitutionally immoral is difficult. Prison populations are heterogeneous, being composed of insane criminals, epileptic criminals, feeble-minded criminals, habitual criminals, occasional criminals, and criminals by passion, and they are all subjected to the same discipline and treatment. Now, it is the crime that regulates the term of imprisonment and not the needs of the criminal. The imbecile offender is condemned to the same rigors of law as is the educated man when convicted of the same statutory offense. It is rather ideal to expect proper scientific classification of prisoners under the present-day administration of penal institutions, but in time physicians will be asked to give the criminal courts such data concerning the prisoner's mental status as will lead to a more scientific dispensation of equity.

He concludes, "Why should not the born criminal remain in prison as long as he is dangerous to society? We do not release the violent and dangerous insane from hospitals merely because they have been detained there a number of years; then why should we release the instinctive criminal to practice his criminal acts upon the public? Why should we not isolate the incurable moral defectives who disseminate dangerous moral contagion?"—(R. F. S.)

WOODWARD, R. C. **Nine years' experience with manic-depressive insanity.** New York State Hospital Bulletin, Vol. V, No. 4.

In an analysis of 262 cases it is concluded that manic-depressive insanity is merely a clinical conception, and that landmarks indicating its boundaries are lacking and that there are no conclusive tests as to what cases are and what are not of this class. Cases fall into all symptom groups. He states that retardation is not a dependable sign. He also demonstrates that the disease has a detrimental effect upon the life of the individual, and that recurrence is always likely, and if it recurs late in life is most liable to render the patient permanently unfit for responsibilities and duties.—(R. F. S.)

FIRTH, A. H. **The pupil and its reflexes in insanity.** Journal of Mental Science, April, 1914.

In an exhaustive article extending through this and the previous number, the author takes up pupillary symptoms in certain types of

mental disease. After careful consideration of the published records and opinions, as well as the results of his own examinations of insane patients, he concludes regarding the pupillary symptoms of mental diseases as follows:

1. General paralysis presents a very large variety of pupillary phenomena, of which the most significant is the Argyll-Robertson sign. Absolute rigidity of the pupil is not so frequent or so significant as reflex rigidity. Most of the other symptoms may be regarded as leading up to or dependent on the development of one of those two conditions.

Many cases terminate before the light reflex becomes extinct. Reappearance of the light reflex when once lost is a possible but rare occurrence. On the whole, the more serious derangements of the iris are more frequent in the advanced stage of the disease.

2. Syphilitic insanity, if accompanied by vascular or syphilitic disease implicating the nervous system, may present marked pupillary symptoms, which are not necessarily permanent. In the functional varieties of syphilitic insanity pupillary symptoms are relatively slight and inconstant.

3. Alcoholic insanity, the most common of the toxic psychoses, is often accompanied by disturbance of the pupils. In rare cases the pupil may not react to light; sometimes the sensory reflex is absent. Sluggishness of the light reflex or of all the reactions is not uncommon; irregularities and anisocoria are fairly frequent. All these symptoms may be subject to change.

4. Insanity with epilepsy presents well-marked pupillary symptoms in association with seizures, but the pupils of epileptics in their habitual state often show variations from the normal. These latter variations are in most cases inconstant and some of them are functional in their nature.

5. Apart from the rare occurrence of marked congenital abnormalities, pupillary symptoms in imbecility and idiocy are usually unimportant; a slight degree of irregularity is occasionally present. The light reflex is rarely impaired; the sensory and physical reflexes may be diminished, occasionally absent.

6. In hebephrenia diminution or loss of "unrest" and of psychical and sensory reaction may be observed. There may be changes in the form and position of the pupils.

7. In catatonia there is frequently diminution or loss of the sensory and psychical reactions and of unrest. Temporary or changing irregularities, eccentricity, and inequality of the pupils are often present. Variation in the activity of the light reaction may occur, usually a diminution.

8. The sensory reaction may be diminished in paranoia, especially where there is a certain degree of dementia.

9. In melancholia of involution a slight degree of inequality and irregularity of the pupils is often perceptible. Changes in the form, position, and size relation of the pupils may occur. In a few cases the light reflex is sluggish and the sensory reaction may be inactive, rarely absent.

10. The pupils in senile dementia tend to be small, usually reacting somewhat sluggishly to light. The near vision reaction may also be impaired. The sensory reflex is occasionally absent. It may be impaired when the light and near vision reflexes are comparatively active.

11. The melancholic phase of manic-depressive insanity presents but few pupillary symptoms. Slight irregularity is not uncommon; anisocoria is relatively infrequent. If there is change in the form or size relation of the pupils, it is slight in amount; the sensory reflex is sluggish in a few cases only. In the maniacal phase slight irregularity and inequality of the pupils are frequently observed. In a certain number of cases the sensory reflex is sluggish. Change in these symptoms may accompany change in the mental state.

The average pupil diameter is the same in the melancholic as in the maniacal phase. The pupil diameter is smaller on the whole in patients who are habitually in a state of excitement. Here there are no marked pupillary disturbances. In a small proportion of cases the sensory reflex is sluggish.

12. In terminal dementia irregularity of the pupil is not very common; slight anisocoria is rather more frequent. As age advances the influence of senility on the condition of the pupils gradually makes itself felt.

13. Apart from general paralysis, epilepsy, and gross brain lesions, more evident pupillary symptoms are found in the toxic psychoses and in senile dementia. In catatonia and in the habitual condition of insane epileptics inconstant sluggishness of the light reaction may be observed.

In many kinds of insanity there is a tendency toward anomalies in the form, position, and size relation of the pupils.

14. It has been claimed that diminution and loss of the sensory and psychical reactions and of the pupil content are typically frequent in the triad of diseases included in the term "dementia precox." These symptoms, however, are not uncommon in other types of insanity, and no special diagnostic importance can be attached to their occurrence.

15. Further investigation of the condition of the pupils in insane patients is required. Each case should be reexamined at regular intervals, and control observations of a sufficiently large number of healthy persons should be carried out under similar conditions.—(R. F. S.)

SCHÜTZE, Dr., MARINE-STABSARZT. **On the occurrence of traumatic dislocations (luxationen) in the Imperial German Navy during the last 20 years.** Heft 8 Veröffentlichungen a. d. Gebiete des Marine-Sanitätswesens, herausgeg. v. d. Medizinalabt. d. Reichs-Marine-Amts, E. S. Mittler und Sohn, Berlin, 1914.

In the present monograph the author gives the result of his careful and detailed investigations of dislocations, their relative frequency as compared to the other injuries in the service, as well as their relative influence on service disability. In frequency of occurrence dislocations are accountable for 10.1 per cent of all injuries due to mechanical causes, occupying the ninth place on the scale: an average of 35 cases per year among 3,476 admissions for injuries of all kinds does not appear to be a large one. When, however, such injuries are followed up further, the end result is of a more serious nature. Among the injuries leading to permanent disability and final discharge from the service, dislocations are second only to fractures, jumping up to second place on the scale of all mechanical injuries. This fact alone is a valuable one to have ascertained and one likely to change our ordinary conceptions of the relative importance of dislocations and of the amount of damage they do to the service. Men having once experienced a dislocation at any one of the larger joints should not be admitted to active service, for the reason that the prognosis in all such cases is most unfavorable as regards functional ability under service conditions.

The author, after discussing the etiology, diagnosis, prognosis, and treatment of dislocations in the light of his experience and the literature on the subject, describes in great detail the special significance attached to each particular dislocation, a study of great interest to the surgeon as well as the statistician. We would recommend the careful study of the original paper, since a brief review could not do justice to the subject.

The conclusions are as follows:

1. Among the mechanical injuries, dislocations occupy the ninth position in frequency of occurrence; in damage to the service, the second position, being inferior in this respect to fractures only.

2. In the naval service dislocations at the knee and ankle joints, the joints of fingers and toes occur with greater frequency than in civil life; this is a direct consequence of service conditions.

3. The causes of these dislocations can not be eliminated, nor can their frequency be diminished under present service conditions.

4. The unfavorable prognosis of dislocations in the naval service is due to the fact that the injuries producing them are here more serious than in other callings. The prognosis appears in a more favorable light when it is considered from the point of view of general work-

ing ability, as is done in general statistics, and not from the point of view of disability for service in the Navy. In this sense the prognosis may even become relatively favorable for the reason that aid is promptly rendered and old cases come under treatment less frequently.

5. In order to insure an accurate diagnosis and to remove all possible doubt about it, a roentgen picture should in every case be made. It is in this manner only that wrong therapeutic measures can be avoided. A small portable roentgen apparatus ought, consequently, be available on board.

6. A more frequent resort to operative intervention should be aimed at than is at present the case, in order to insure service ability; the prognosis, on the whole, would thereby be rendered more favorable than it now is.

7. Inasmuch as recurrences of old dislocations are frequent, especially at the shoulder joint, recruiting officers should pay closer attention to this defect in order that those affected may be excluded from active service in the Navy.—(H. G. BEYER, MEDICAL DIRECTOR, U. S. NAVY, RETIRED.

BIRRELL E. T. F., MAJOR, R. A. M. C. **The wounding effects of the Turkish sharp-pointed bullet.** Jour. R. A. M. C., Vol. XXII, No. 3.

The recent adoption by several countries (including the United States) of the pointed bullet for small arms led to much speculation and a number of experiments having in view an estimate of the effects of the new projectile as compared with older types with ogival heads. While the pointed bullets so far in use vary in minor details, they agree in certain essential features; higher velocities of translation (2,700 feet per second or more) and rotation, and a change in the center of gravity, which is now nearer the base. It was assumed that, as the bullet was poorly balanced, slight resistance would cause it to turn on its axis, with consequent great increase in its destructive effect on tissues, and experimental firing tended strongly to confirm these views. Fessler, experimenting with the German "S" ammunition upon human and animal cadavers at ranges of from 10 to 1,500 meters, found that even slight resistance, such as the chest wall, a portion of equipment, or even, at short ranges, the abdominal wall, caused the bullet to turn over on its axis. "Thereafter it passes through the tissues broadside-on, or turned completely around, base first, presenting a larger striking surface, but at the same time preserving a practically undiminished velocity, and therefore creating a more formidable wound. The condition of the track of the bullet through soft tissues and bone after

turning, and the lacerations which it caused in abdominal organs even without turning, led to the belief that with such a projectile almost all wounds of the abdomen would prove fatal, and that therefore the provision of a proportion of specially large first field dressings, more ample measures for arresting hemorrhage, and an increased supply of splints for the serious damage to bone which could be expected. Amputations, it was anticipated, would require to be more frequently performed than in wars in which the ogival-tipped bullet was used."

A further series of experiments conducted by Lieut. Col. Pilcher, while tending to corroborate Fessler's observations in the main, did not lead the investigator to anticipate greatly increased severity in bone injuries, and while he considered the pointed bullet a more severe projectile than the round-nosed, small-bore bullet, he doubted if the contrast was really striking.

(In this connection the views of Largarde are of interest. In his new work "Gunshot Wounds" he states that "the war wounds of the future will be much more grave. Body wounds will be more uniformly fatal; injury to bone will be more extensive and prone to suppuration. The humane character of the reduced caliber bullet wounds so happily noted in recent wars will be less frequent. This will be especially true of wounds of the lungs and epiphyseal ends of bones." And further, "the effects of the pointed bullet in the Turco-Balkan War of 1912–13 have sustained the estimates of the experimenters as to its degree of deadliness.")

Birrell's conclusions are quite the contrary. He finds that the wounding powers of the pointed bullet as seen in the Balkan War were slight in comparison with the effects observed by the experimenters. Fraenkel characterized the wounds observed as "generally much the same as were noted in recent campaigns," though he and Tintner saw many evidences of extensive damage from longitudinal rotation of the bullet. Grinberger considered the injuries caused by the sharp-nosed Turkish bullet more favorable, on the whole, for speedy healing than those resulting from the blunt-nosed Servian bullet, although the latter is of smaller caliber. He thought the Turkish bullet the more "humane."

The experiences of the British Red Cross Society's units bore out those of other obesrvers as regards the general similarity of wounds inflicted by the pointed bullets. Bullets frequently lodged, but none appeared to have turned over or been deflected. "As a rule, the bullets appeared to have passed straight through soft parts and organs without deflection, turning, or setting-up, doing very little damage; only two amputations were necessary. In a few cases, believed to have been hit at extreme range, the wounds of exit were of the explosive

type. No splitting or stripping of the envelope was noted, and the only deformed bullet found lodged had obviously been a ricochet."

Statistics from recent wars (Crimean to Russo-Japanese) show that on a pretty constant average four men are wounded to every one killed in battle, and the Bulgarian and Servian casualties at the storming of Adrianople were of this order (1 to 5.1 and 1 to 4.2, respectively). "The Bulgarians themselves frequently remarked that the Turkish bullet was very humane, and surprise was expressed at the few men killed in comparison to the number wounded."

Birrell consequently finds it difficult to accept figures, said to be official, which show for the Bulgarian losses (first Balkan campaign) a proportion of 1 killed to 1.28 wounded. (Lagarde, quoting Maj. Fauntleroy, our military observer, gives the ratio as 1 to 2.5 for the total casualties of the Bulgarian Army, and concludes "that the Turkish sharp-pointed bullet caused injuries no more severe than would be expected from a small-bore, high-velocity bullet of the ordinary type.")—(T. W. RICHARDS, SURGEON, U. S. NAVY.)

DAVIS, D. M. **Intestinal obstruction: Formation and absorption of toxin.** Johns Hop. Hosp. Bul., February, 1914.

Three principal theories have been advanced to explain the death which occurs when the gut is obstructed: (1) That of a nervous reflex, (2) that of infection, (3) that of intoxication. The first of these now receives little attention. The second has many advocates, but there has been a great mass of evidence brought forward to show that a strong toxic factor is at work in these cases and that death may occur without any infection of the peritoneum or blood. Whipple has shown that if a portion of the duodenum of a dog be closed off from the remainder of the bowel by means of ligatures so placed that the blood supply of the closed loop is not interfered with, the symptoms of ileus come on very quickly and death results. If a fistulous opening be made from the closed loop to the outside, death may still take place, although not so quickly, and the material secreted through the fistulous opening is toxic for other animals. Whipple, Stone, and Bernheim have also shown that animals can be immunized by giving them sublethal doses of the toxic contents of closed loops, and that an animal so treated will remain alive when subjected to the closed-loop operation for a much greater length of time than was ever found in unimmunized animals.

Davis endeavored to test the toxicity of the intestinal secretion while still uninfluenced by bacterial activity. He made closed duodenal loops in dogs in such a way as to exclude bile and pancreatic

secretion from the loop, and through a fistulous opening removed the secretions of the closed loop by lavage. The washings were so preserved that bacterial growth was prevented, the washings were concentrated, and then after filtration were given intravenously to healthy dogs. The results were identical with those obtained by the injection of closed-loop fluid obtained in the ordinary manner, and may be taken as proof that bacterial activity, at least in these experiments, played no part.

Davis next considered the question of the manner in which these or other toxic substances gained entrance to the blood. Two sets of experiments were carried out—one, absorption experiments with toxin, the other absorption experiments with phenolsulphonephthalein. The experiments with toxin were carried out as follows: Fresh duodenal loops were made in dogs and into these loops at the time of operation were introduced fluids of known toxicity from other closed loops which had been allowed to go on three to four days. It was to be expected that if the normal mucosa was capable of absorbing this toxin, or if the contents themselves would influence the mucosa, chemically or otherwise, to absorb the toxin, the animals would begin very soon to show toxic symptoms. They did not do so, however, the clinical course in these cases being exactly the same, in symptoms and length of time, as that of dogs with closed loops not treated in any way at the time of operation. The supplied toxin apparently remained in the bowel entirely harmless in the first 24 hours at least. In the phenolsulponephthalein absorption tests no definite conclusions were reached. The absorption, or, at least, the excretion of the dye, was delayed somewhat, but the amount excreted in six hours was substantially the same as that in normal dogs in which the dye had been injected into the bowel.

The only inference that the writer draws from these experiments is that in obstruction and closed loops a change takes place in the mucosa, although nothing is seen with the microscope, which allows the cells in some manner to discharge the fatal toxin into the blood. It has not been possible to demonstrate any increased permeability of the mucosa to the toxic substance.—(G. B. CROW, PASSED ASSISTANT SURGEON, U. S. NAVY.)

HYGIENE AND SANITATION.

C. N. FISKE, surgeon, and R. C. RANSDELL, passed assistant surgeon, United States Navy.

PEASE, H. D. **Relation of oysters to the transmission of infectious diseases.** Trans. 15th Internat. Cong. Hyg. and Demogr., Washington, 4 (1912), Sec. 5, pp. 203–213.

In this paper what the author believes to be the best-informed opinion regarding infection by shellfish is summarized as follows:

Outbreaks of acute gastro-intestinal disturbances and of typhoid fever have been shown to be due to the consumption of raw oysters and clams which have been floated in specifically polluted waters during a nonhibernating season of the year for these shellfish, but * * * no evidence exists that oysters taken from their natural or final maturing beds during any season of the year, nor that any oysters—floated or not—during their hibernating period have ever caused outbreaks or endemic conditions of any infectious disease.

The burden of official supervision, therefore, is determined by the life cycle of the oysters and the practical requirements for the conduct of the business. The important point is to determine the sanitary conditions of the drinking places during the late summer and early fall months. When this has been accomplished it will doubtless be found that oysters taken from waters in at least the more northern sections of the Atlantic coast have ceased to be a factor in the transmission of infectious diseases.—(E. W. BROWN, PASSED ASSISTANT SURGEON, U. S. NAVY.)

EUSTIS, A. C. The proper diet in the Tropics, with some pertinent remarks on the use of alcohol. Am. Jour. Trop. Dis. and Prev. Med., 1 (1913), No. 4, pp. 288–293.

The author holds that there is greater danger from an excessive use of meat in tropical than in temperate regions, because "ptomaines," which may be produced from undigested meat by the action of putrefactive bacteria in the colon, and which, under ordinary conditions, would be "rendered inert by the liver cells," would not, in his opinion, be so taken care of where there is little severe exercise, as in the case of most residents in warm regions.

He believes further that in such regions "there is little need of internal combustion to maintain the body temperature."

Similar arguments are given against the use of alcohol.

In the author's opinion, not more than 40 gm. of protein per day should be eaten in the Tropics. He believes that the energy value of the daily diet should be from 2,000 to 2,500 calories, depending upon the muscular work done, fats being taken in moderation and the energy supplied largely from carbohydrates, that vegetable proteids are preferable to animal proteids, and that the diet should contain an abundance of fruit and vegetables.

The desirability of limiting the amount of meat in the diet is illustrated by a case cited in which symptoms of toxemia in a patient were overcome by reducing the meat consumption and which the author considers typical of many which he states have come under his observation.—(E. W. BROWN, PASSED ASSISTANT SURGEON, U. S. NAVY.)

MASSACHUSETTS ASSOCIATION OF BOARDS OF HEALTH. **Report of committee upon period of isolation and exclusion from school in cases of communicable disease.** Am. Jour. Public Health, Vol. IV, No. 4, April, 1914.

Among the detailed instructions by which boards of health are advised to be governed in the control of the various affections it is noted that—

(*a*) Mode of infection is from upper air passages in diphtheria, scarlet fever, measles and so-called German measles, whooping cough, influenza, and pulmonary tuberculosis; by secretions of the mouth in mumps; and by lesions of skin and mucous membranes in chicken pox and smallpox.

(*b*) Period of isolation. Diphtheria, until two successive negative cultures from nose and throat.

Scarlet fever, minimum of five weeks and as long as any lesion of ear, nose, or skin.

Measles, 10 days from appearance of eruption (disease is considered most highly infectious during 4 days prior to eruption).

Chicken pox and smallpox until recovery and lesions of skin and mucous membranes are healed.

Whooping cough, minimum of three weeks and throughout paroxysmal stage.

Mumps, three weeks.

Influenza, until subsidence of catarrhal symptoms.

Pulmonary tuberculosis, only the recalcitrant patient should be isolated.

(*c*) Disinfection unnecessary after measles, chicken pox, whooping cough, mumps, and influenza.

Disinfection recommended by boiling objects infected and scrubbing woodwork and furniture after diphtheria, scarlet fever, smallpox, and pulmonary tuberculosis.—(C. N. F.)

CHASTANG, Dr. **Résultats d'une enquête relative à la morbidité vénérienne dans la division navale d'Extrême-Orient et aux moyens susceptibles de la restreindre.** Arch. de Méd. et Pharm. Nav., Tome 111, No. 2, February, 1914.

In his 1913 report Chastang outlines the well-known prevalence and disability from venereal infections experienced by naval personnel in the Far East. Over 20 per cent of the average total morbidity for that division for years 1910–12 was occasioned by venereal disease, the usual venereal admission rate (137.17) for Indo-China and the Far East averaging more than twice those of other foreign stations and of the French Navy in general. In China there is no sanitary surveillance of prostitutes, while in Japan periodical medical inspection concerns itself largely with the detection of syphilis, little attention being paid to gonorrhea.

The point is made that rates on cruising ships, with their diversity of interest, though spending almost as many days in port, are about one-third as high as in the crews of the river gunboats. Throughout the report the beneficial effects of gymnasium, club and lecture hall, football, and tennis is emphasized. The river gunboat *Pei-Ho*, for instance, stationed at Tong-Ku, Teintsin, having reduced her annual venereal morbidity from 290 and 275 days in 1910 and 1911, to 6 days in 1912, largely through efforts in such directions.

The method of treatment appears to be a determining factor in the duration of disability in each disease. Statistics showed that large frequent prolonged irrigations of weak permanganate solution were most efficacious and were followed by a minimum of complications from gonorrhea.

Early small incisions, before any signs of softening, greatly reduced the percentage of suppurating chancroidal buboes, so slow to heal in the tropics. If incision is unfortunately delayed until suppuration occurs, enucleation should be the rule.

Upon the first sign of phagedenic ulcer, which practically signifies double infection, vigorous antisyphilitic treatment should be instituted.

The secondary manifestations of syphilis in the Orient are very apt to be few or not conspicuous, which tends to failure of diagnosis and effective treatment, so that early tertiary lesions of unctrtain etiology are commonly serious.

Venereal prophylaxis by moral suasion was shown by statistics to be ineffective, but as soon as the examples set by the English and German ships were followed by compulsory replies at sick bay, where all liberty lists were checked, the reduction in disability was phenomenal—and this was more particularly noted on ships whose senior medical officers could be depended upon to see that the procedures were conscientiously carried out. . Permanganate seemed to most surgeons to be fully as efficacious as the silver salts, although the author was inclined to favor the latter.—(C. N. F.)

SCHRÖDER, H. **Ship's hygiene in the middle of the seventeenth century.** Arch. f. Sch. u. Trop. Hyg., Bd. 17, Hft. 24.

At the height of the Greenland whaling industry the German North Sea islands alone sent out 3,000 souls yearly. Among the interesting ship's orders are those interdicting all card playing, all tobacco smoking except where specified by the commanding officer (probably on account of ventilation); each before coming to mess must have rinsed his mouth and washed his face and hands; "each was required every eight hours to walk under the main hatch and pull

out his shirt to show if any vermin were present." Roaches caused considerable trouble by invading the external auditory canal during sleep. The "doctor" was as a rule the barber. The captain carried, in the main, the duties of a medical officer.

Scurvy, of course, was most to be feared, and even at that time fresh vegetables, such as "Greenland salad," were found most beneficial. This disease is referred to in the folk stories of the northern lands even as far back as the tenth century.—(R. C. R.)

RUGE, R. **Progress in ship's hygiene during the nineteenth century.** Marine-Rundschau, 1913, S. 576 f. f. Berlin.

The following remarks should be of present interest: "It was not until 1825 that the excessive use of spirits (one-fourth liter per head daily), until that time called the king's or queen's allowance, was replaced by tea and cocoa." Old sea dogs * * * predicted the ruin of the English Navy by such measures. However, the new order remained, and the fleet was freed of the worst drunkards (Friedel). How long this official banishing of alcohol lasted is to be found in the old reports of the health of the Navy. In the years from 1830 to 1861 the prevalence of delirium tremens averaged 2.8 per cent, and in 1860 on the Australian station climbed to 18.1 per cent.

Also in the French Navy, which had its second improvement of commisariat in 1813, the amount of officially issued alcohol remained comparatively high. Sixty c. c. (about a wineglassful) of spirits or rum for breakfast, for the other two meals one-fourth liter wine, and the addition of 25 c. c. spirits or rum per capita added to the water used was the daily program. In addition the engine-room personnel received per head 12 c. c. spirits and 0.23 liter of wine, so that a fireman could officially receive 109 c. c. spirits and about a liter of wine daily.—(R. C. R.)

ROGERS, S. A., AND DAHLBERG, A. O. **The origin of some of the streptococci found in milk.** Jour. of Agric. Research, March, 1914.

A collection of cultures of streptococci was made consisting of 42 cultures from milk which formed chains in lactose bile at 37° C., 51 cultures from infected udders, 114 cultures from bovine feces, and 39 cultures from the mouths of animals.

The morphology varied under different conditions and could not be correlated with the source of the culture, except that the udder cultures had a more marked tendency to chain formation than those from other sources.

The ability of these cultures to liquefy gelatin and to form acid from dextrose, lactose, saccharose, raffinose, starch, inulin, mannite, glycerin, dulcite, and adonite was determined. Only one or two cultures utilized adonite or dulcite.

When glycerin was attacked, the fermentation proceeded slowly, failing to reach its maximum in 14 days, in contrast to the fermentation of the sugars, in which the maximum was reached in two or three days.

A high percentage of the udder cultures failed to give the characteristic reduction in litmus milk.

Twelve cultures liquified gelatin; 1 of these came from milk and 11 from infected udders.

The cultures from feces were characterized by their activity in fermenting the sugars, including raffinose, and their inability to utilize the alcohols.

The mouth cultures fermented dextrose, saccharose, lactose, mannite, and frequently raffinose, but were almost without effect on starch and glycerin.

The udder cultures were characterized by the general lack of fermentative ability, which was limited almost entirely to dextrose, saccharose, and lactose, with a comparatively small number utilizing mannite, glycerin, and gelatin.

When the udder cultures were divided on the basis of gelatin liquefaction, two groups were obtained. The fermentative activities of one of these, which are similar to those of *Streptococcus pyogenes*, were limited to dextrose, saccharose, and lactose, with an occasional culture fermenting mannite, starch, and lactose, or inulin. The second group fermented the three simple sugars, mannite, and usually glycerin and liquified gelatin.

When the milk cultures were considered individually, it was found that with the exception of two, which clearly came from feces, they could be included in one or the other of the two groups into which the udder cultures were divided.

Of the 41 nonliquefying udder cultures 24 gave identical reactions. The remaining cultures differed from the type in one or two characters only.—(R. C. R.)

GIEMSA, G. **On the further perfecting of mosquito spraying.** Arch. f. Sch. u. Trop. Hyg. Bd. 18, Hft. 1914.

In the Bulletin of July, 1913 (p. 453), we reviewed Giemsa's method and the mixture used; in the present article he elaborates on the latter and summarizes as follows:

Soap constitutes the best base, used in the following mixtures: (*a*) 50 c. c. tr. green soap (Germ. Pharm.) with 1 liter water; (*b*)

15 gr. medicinal soap (sapon. med. pulv. G. Ph.) to 1 liter: (c) 9 c. c. tr. green soap with 1 liter water and 24 c. c. formalin: (d) 5 gr. sap. med. pulv. to 1 liter water and 20 c. c. formalin. Soft water, preferably rain water, is recommended.

The formaldehyde soap solutions work most energetically, and in stronger solutions are available for use against houseflies, ticks, *Glossina morsitans*, *G. palpalis*, etc. The formaldehyde mixtures have the advantage over strong smelling cresol mixtures in that ammonia promptly removes the odor from a room after use of the former.

The method is also recommended by its extreme cheapness.—(R. C. R.)

TROPICAL MEDICINE.

E. R. STITT, medical inspector, United States Navy.

CANDIOTTI, M. C. **Le transport colloïdal de médicaments dans le choléra.** Arch. de Med. et Pharm. Nav., March, 1914.

The writer records the results of a new method of treatment as observed during the cholera epidemic in Constantinople in 1912–13. The method is based upon the investigations of Riquor, who expressed the view, in February, 1908, that "if a medicinal substance is added to an artificial colloid the therapeutic effect of the latter is augmented."

In the experiments conducted, a solution of methylene blue was used as the colloidal medium, being readily sterilized, with magnesium chlorid as the medicament. Later, mercuric chlorid was added to the above, apparently with decided advantage. Unfortunately, the technic and exact dosage are not described, the writer simply referring to injections, once to thrice daily, of 5 c. c. of the solutions employed.

Several series of experiments were conducted, which may be summarized as follows:

1. Unselected cases: From October 25 to December 31, 1912, 443 cases of cholera were treated by Dr. Evelpedès in the Greek hospital, Yedi-Koulé, using a solution without mercuric chlorid. There were 329 recoveries, giving a mortality of 27.3 per cent. Of these cases, however, 13 were moribund upon admission, death ensuing within one-half to three hours; deducting these, there remains a net mortality of 24.37 per cent, which was "less than that of preceding periods and former epidemics, not only in Constantinople but in other countries."

2. Selected cases: These were all cases of the gravest type, which were considered practically hopeless (*jugés mortel*), "in a hypothermic state and pulse nearly imperceptible, the diagnosis being

confirmed by bacteriologic examination of the dejections." Of 33 such cases treated by Dr. Evelpedès, 22 recovered. In addition to the colloidal solution, these cases received injections of serum and caffein.

Dr. Riquor then treated 4 cases solely with the methylene blue and magnesium chlorid solution; after temporary improvement, death supervened in each case. In 8 successive cases mercuric chlorid was also employed, and in this series there was but 1 death, the patient having received his first injection 12 hours after onset.

Of 80 cases received by Dr. Djemil-Suleyman, 10 of the most severe were treated with the modified (mercuric chlorid) solution, 7 of these recovering.

Thus, including the 4 cases treated without mercuric chlorid, there were 74 per cent of recoveries in a total of 55 cases of the gravest type.

In conclusion, Candiotti records briefly 80 cases of dysentery, all ending in recovery under this method of treatment.—(T. W. RICHARDS, SURGEON, U. S. NAVY.)

Cholera in the Turkish Army. Lancet, Feb. 15, page 484.

An illuminating description of the conditions among the cholera-stricken soldiers during the Balkan War is contained in a letter to the Lancet from the British delegate to the Constantinople Board of Health.

Early in November, 1912, cholera appeared among the troops at Tchatalja and spread rapidly. Large numbers of the sick and dying were sent to Stamboul, and the roads leading to the city were littered with the bodies of those dead of the disease. Temporary hospitals were quickly filled to overflowing, and the principal mosques were then utilized. The disastrous result was contributed to not only by lack of organization but also by inhumanity. The mosque of St. Sophia was surrounded by armed troops who prevented all communication with the outside, while the cholera victims on the inside were left without treatment and almost without food or care of any kind. The number of deaths in this mosque has been estimated at 700 to 1,500. When the building was turned over to the board of health for disinfection the mattings covering the floor were soaked with cholera discharges and littered with human excreta. It took over three weeks to clean the building. At St. Stefano the sick and dying were left without shelter or care of even the most rudimentary kind until some heroic individuals interested themselves in their care.

Numerous cases of spontaneous gangrene of one or more extremities were observed. This condition was brought about by long exposure to wet and cold, general malnutrition, and lack of treatment

at the outset of the condition. The failure of the commissariat of the Turkish Army has become notorious. Patients stated that it was no uncommon thing to go for two or three days without food, while one group had for three days no other food than grass or wild herbs.

The opinion is expressed that the organism causing the cholera had been for many years in Europe, thus losing much of its virulence. Had it been one newly imported from India or the Far East, the results probably would have been even more disastrous.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

GUITERAS, J. **A supposed case of yellow fever in Jamaica. (Un caso supuesto de fibre amarilla en Jamaica.)** Sanidad y Beneficencia, Havana, Tomo x, Num. 5 y 6.

Guiteras calls attention to an article on the "vomiting sickness" of Jamacia by Dr. Harold Siedelen, which appeared in the Yellow Fever Bulletin published by the Liverpool School of Tropical Medicine, and takes issue with Dr. Siedelen on certain of his conclusions.

Siedelen does not arrive at any definite decision as to the nature of this curious disease. Some of the cases were evidently forms of meningitis, others were gastroenteritis. The suggestion that these cases might be yellow fever was carefully considered, but this diagnosis was definitely excluded except in one case, occurring in a Chinaman, in which the diagnosis of yellow fever was made. It has been held by some that the infectious agent of yellow fever remains permanently in those places where it has once existed and from which it is supposed to have disappeared. So, although the disease has disappeared, as from Havana, it is implied that it may persist in the interior of the country. Guiteras believes that this preconceived idea influenced Siedelen in making the diagnosis of yellow fever in the case mentioned, which case, Guiteras believes, did not present the symptoms of that disease, and the following grounds for doubt are stated:

1. The patient was a Chinaman. Yellow fever is rarely fatal in the Chinese and in Cuba they were believed to be immune.

2. Absence of fever. There was no fever on the third or fourth day in a fatal case of four days' duration. Such a history makes the diagnosis of yellow fever very doubtful and is suggestive of food poisoning.

3. Doubtful jaundice on the fourth day of the disease in a case terminating fatally on that day. In fatal cases of this duration the very general rule is that the fever is high and the jaundice and black vomit develop early and continue increasingly to the end.

4. Tongue coated with a blackish fur. This is very rare in short cases of yellow fever, though not rare in prolonged typhoid cases.

5. Pulse 90 with no fever. In yellow fever the pulse is much more likely to be 70 or lower, if the temperature has fallen, even within 24 hours of death.

6. The contents of the stomach were not those usually found in a case of yellow fever.

Besides these six grounds for doubt, attention is also called to the fact that the case occurred in a country where there was no yellow fever.

NOTE.—In the Yellow Fever Bureau Bulletin, April, 1914, Dr. Siedelen replies to the criticisms noted above and upholds his diagnosis of yellow fever. He maintains that yellow fever apparently disappears for years, and, without any evidence of reintroduction, reappears in virulent form; that an endemic infection continues in an attenuated form, causing mild and atypical cases of the disease, and that those cases are the most dangerous from an epidemiological point of view.—(L. W. JOHNSON, PASSED ASSISTANT SURGEON, U. S. NAVY.)

DUTCHER, B. H., MAJOR, U. S. A. **Note on a new geographic locality for balantidiosis.** Journ. Trop. Med. and Hygiene, Apr. 1, 1914.

A native of Porto Rico was admitted to hospital complaining of symptoms of mild dysentery. A differential blood count showed 40 per cent eosinophiles and 6.5 per cent of large mononuclears. In the bloody mucus of the stool *Balantidium coli* was found. The stools also showed hookworm and whipworm ova.—(E. R. S.)

PLATE, L. **Brief note on Toxoplasma pyrogenes.** Journ. Trop. Med. and Hygiene, April 1, 1914.

This authority states that he examined Giemsa stained spleen smears from a long standing case of splenomegaly reported by Castellani from Ceylon.

He was convinced that the bodies were not degenerated red cells nor degenerated tissue of any kind. The free bodies were crescentic or pear shaped, with a well-developed nucleus in the center or at one pole. In his opinion these bodies are protozoa and differ from any protozoa so far reported for man. He does not think we can conclude that they are toxoplasmata. In fact no conclusion can be drawn as regards their exact zoological classification.—(E. R. S.)

CASTELLANI, A. **Note on certain protozoa-like bodies in a case of protracted fever with splenomegaly.** Journ. Trop. Med. and Hygiene, Apr. 15, 1914.

In a case of splenomegaly, associated with an intermittent fever, which rose each day to 103°–105° F. and fell to normal without

sweating. Castellani found at autopsy no evidence of malarial infection in the spleen.

In the blood and in the spleen smears of the case certain peculiar bodies were found, but only after prolonged search. These bodies were from 7 to 12 microns in maximum diameter and usually vacuolated. The protoplasm stained a light blue and several large masses of chromatin were present.

In the spleen smears he also found, more numerously, bodies about 2 to 6 microns in diameter with a single large chromatin mass at one pole of the faintly blue staining body.

These bodies could not be confused with Leishmania. Except for the fact that the bodies were almost never found in leucocytes he would consider them as toxoplasmata. The bodies were generally free.—(E. R. S.)

ROGERS, L. **The emetine and other treatment of amebic dysentery and hepatitis, including liver abscess.** Indian Medical Gazette, March, 1914.

The author treated cases of amebic dysentery with cephaeline and noted its marked inferiority to emetine, as shown by relief of dysenteric symptoms.

Rogers gives 1 grain of emetine by hypodermic injection once daily. In cases declining injection he finds that keratin coated pills of emetine are more effective and less distressing than when powdered ipecac is used although nausea is apt to occur when emetine is given by mouth.

It is best to have the patient lie quiet for two or three hours and take no food during that time following an injection of emetine.

In amebic hepatitis Rogers notes that the emetine should be kept up for two or three weeks, such continuation of treatment being controlled by repeated blood counts as a leucocytosis indicates activity of amebic process.

He notes the success of treatment of liver abscess by aspiration with injection of a solution of one grain of emetine in one ounce of water into the abscess cavity, together with emetine hypodermically.

He believes that it will be possible to omit the injection of emetine into the abscess cavity and thus treat such cases with aspiration and hypodermic injections of emetine alone.—(E. R. S.)

BAHR, P. H. **A study of epidemic dysentery in the Fiji Islands.** British Medical Journal, Feb. 7, 1914.

The author notes that in former epidemics of dysentery in these islands the mortality has been reported as high as 48 per cent, but more recently the statistics would indicate a death rate of about 16 per cent.

For diagnosis the mucous-like stool was plated out on Conradi-Drigalski medium, the bacterial colonies being recognized as dysentery ones by the various sugar reactions in litmus peptone solution, by agglutination tests with a polyvalent antidysenteric serum in dilution of 1 to 50, and by toxic effects upon intraperitoneal injection of guinea pigs.

The Shiga-Kruse strain was the one most frequently isolated, but cases due to the " Y " type were not rare.

Clinically, the cases varied from very mild ones in which there was only a little blood and mucus coating a formed stool to these in which call to stool was incessant and in which the patients would die in 2 or 3 days. In some cases the temperature was subnormal, while in others it was above 103° F.

The serum of 74 per cent of the patients showed agglutinins, but this never occurred before the sixth day from the commencement of symptoms.

He notes the confusing appearance of large phagocytic cells, often containing red blood cells, which may be mistaken for amebæ.

As regards epidemiology, the outbreak occurred at the time of greatest rainfall and highest temperature.

There was no evidence that the disease spread through contamination of the water supply or food supply by fecal material, but strong suspicion was attached to the house fly as a transmitting agent.

On two occasions Bahr isolated a Shiga-Kruse type bacillus from the intestinal tract of house flies.

As regards treatment, the author notes that in his first series of 53 consecutive cases, 41 per cent of which were serious cases, and in which the saline treatment was employed, the death rate was 13.2 per cent.

Sodium sulphate in drachm doses was given every hour for the first 24 hours, and subsequently that dose every 4 hours.

In a subsequent series of cases, with 42 per cent of severe cases, he gave, in addition to saline treatment, injections of a polyvalent antidysenteric serum from the Lister Institute, in doses of 20 c. c. for adults and 10 c. c. or less for children.

In apparently hopeless cases injections of 50 to 70 c. c. was followed by marked improvement within 24 hours. There were no deaths in a series of 5 gangrenous cases of severest type which were treated with the serum. Bahr believes that the combination of the serum injections with the saline treatment is the rational one. He also recommends the combined emetine and antiserum treatment in severe cases rather than waiting to diagnose an amebic or bacillary origin.—(E. R. S.)

A. B. CLIFFORD, passed assistant surgeon, and G. F. CLARK, passed assistant surgeon, United States Navy.

BIRT, C. **The best method of staining Treponema pallidum.** Journ. R. A. M. C., Vol. XXII, No. 3, March, 1914.

The heavy responsibility thrown upon the surgeon of making a diagnosis before the chancre becomes indurated, so that the disease may be aborted with certainty before the organisms can invade the blood stream, demands a microscopical diagnosis which shall be even more conclusive and more easily made than for malarial organisms. Immediately the sore is visible as a slight excoriation or minute papule the serous exudate from the cleaned surface should be examined "with the dark-ground condenser, or by the Günther-Wagner pelican black, or collargol methods." Dried films and a one-sixth objective with an assurance of many deeply stained treponemata in a positive case places such a diagnosis within the facilities of the average physician. The latest modification of the Fontana method based upon the Levaditi stain is given as follows:

The films of the suspected material are dried in air; they must not be fixed by heat. Huge's fluid which consists of 1 c. c. of acetic acid, 20 c. c. of formalin, and 100 c. c. of distilled water is poured over them and is renewed several times in the course of a minute. After washing with water, they are treated with a mordant, which is a 5 per cent solution of tannic acid in a 1 per cent watery solution of carbolic acid. The slide covered with the mordant is heated till steam arises, left for half a minute, and then washed with water for 15 to 30 seconds. Without drying, the silver stain is next applied. This is a 0.25 per cent solution of silver nitrate in distilled water, to which ammonia has been added with a capillary pipette until a slight turbidity is evident. If excess of ammonia is introduced, the fluid becomes clear again, and is useless for staining purposes; a trace of ammonia is all that is required. This silver solution is poured on the slide, which is heated until steam is given off, and left for half a minute. The slide is then washed with water, dried with blotting paper, and mounted in xylol balsam if permanent preparations are desired, since cedar oil soon causes the spirochetes to fade. The jet-black treponemata stand out prominently on the clear background, and appear to be much thicker than when stained with aniline dyes. They may be identified with the one-sixth objective. They attract the attention immediately, so that if they are present in the film they can be detected in a few seconds or minutes. * * * It is not necessary to be accurate in the strength of the silver nitrate solution; a crystal of the salt dissolved in 2 or 3 c. c. of distilled water in a test tube, to which may be added a minute drop of ammonia water from a capillary pipette, gives satisfactory results.

Such a method lacking the difficulties and uncertainties of the Leishman, Giemsa, or Herxheimer gentian violet stains should facilitate a notable and much-needed advance for preventive medicine.—(C. N. FISKE, SURGEON, U. S. NAVY.)

WEINZIRL, J., AND NEWTON, E. B. **Bacteriological methods of meat analysis.** Amer. Journ. Pub. Health, May, 1914.

There is no recognized standard for condemning meat, the usual test being the "organoleptic" or rejection by smell, appearance, feel, etc., and the ammonia test. The authors suggest that there is no valid reason why the same should not be done with meat as has been done with milk, and recommend 10,000,000 bacteria per gram as the limit for sanitary purposes.

Only muscle tissue should be analyzed. The essential point of the method used consists in triturating the meat in a mortar with sand by means of a pestle. After grinding the two together for some time a small amount of sterile salt solution is added and the grinding continued; finally the volume is brought to 100 c. c. and thoroughly mixed. Suitable dilutions are made and portions plated. The sand, motar, and pestle are, of course, thoroughly sterilized previously. For medium the use of agar +1.5 acid and incubation at 20° C. are recommended.—(R. C. RANSDELL, PASSED ASSISTANT SURGEON, U. S. NAVY.)

WARTHIN, A. S. **Primary tissue lesions in the heart produced by Spirochete pallida.** Amer. Journ. Med. Sci., May, 1914.

The frequent association of forms of chronic myocarditis, fibroid heart, anemic infarction of the myocardium and coronary sclerosis, with other pathological evidences of syphilis elsewhere in the body, has given the pathologist a strong leaning to the view that the heart is one of the most frequently affected organs in syphilis. The author considers the most frequent pathognostic lesion complex of syphilis to be that shown by the heart, aorta, and the orchitis fibrosa syphilitica of the testes.

That these lesions are actually syphilitic could only be assumed upon the strength of circumstantial evidence before the demonstration of the *Spirochete pallida* gave us a positive finding by which the diagnosis of syphilis could be made absolute.

In working over the pathology of syphilis, particularly that of the heart, from this standpoint the author used 200 hearts, 50 of congenital syphilis and 150 of acquired syphilis, representing all ages and stages of the disease. For the demonstration of the spirochete in sections the original Levaditi method was used as being most satisfactory. For the study of tissue changes ordinary staining methods were employed with resort to special stains when required.

After a description of the cardiac lesions the following conclusions are reached:

These studies in cardiac syphilis would show that the primary lesions produced by the *Spirochete pallida* may be either parenchymatous or interstitial. The parenchymatous lesions are a peculiar pale degeneration, fatty degeneration, simple atrophy, and necrosis; the intestitial lesions are the occurrence of a peculiar form of edema (myxedema), vascular and perivascular infiltration, and localized myxoma-like formations. The parenchymatous and interstitial changes may be independent or associated with each other. The more marked the interstitial changes the more likely are parenchymatous lesions to be associated with them, but the most marked parenchymatous lesions may occur without any interstitial changes. The purely parenchymatous lesions are found especially in virulent congenital and active secondary and early tertiary syphilis; in milder and older infections the interstitial changes, particularly the vascular and perivascular proliferations, predominate.

The author notes the frequent localization of spirochetes in the heart, finding the cardiac localization more common than the hepatic. Spirochetes may be found in great numbers in the heart when no others can be found elsewhere in the body.

That syphilis can produce purely parenchymatous lesions primarily in the myocardium opens up greatly the possibilities of this infection as a factor in the increasing myocardial affections of unknown origin.

The author believes that syphilis, both congenital and acquired, is the most important etiological factor in the production of cardiac disease, both myocardial and endocardial.—(A. B. C.)

WHITNEY, C. M. **Ten tests by which a physician may determine when a patient is cured of gonorrhea.** Boston Med. and Surg. Journ., May 14, 1914.

The author recommends the following:

(1) Examination of any urethral discharge.

(2) Examination of urine for clearness and shreds.

(3) Instrumental examination of urethra for tender areas or stricture.

(4) Urethroscopic examination.

(5) Examination of prostate and vesicles by gentle massage. Examination of discharge for gonococci.

(6) Test by alcohol—permitting patient to indulge in malt liquors. Afterwards note and examine any discharge.

(7) Coitus is not countenanced, but should the patient indulge, it is to be noted if the discharge reappears.

(8) Discharge induced by antiseptics, as silver nitrate, 1 to 4,000.

(9) Examination by culture and staining of vesicular and prostatic secretion, obtained by expression.

The culture medium recommended is blood agar. Cultures are taken after the anterior urethra has been washed by sterile salt solution and the glans penis has been cleansed by alcohol.

(10) Complement fixation tests.

The author notes that negative tests may be obtained when clinical and bacteriological methods show infection or that the complement fixation test may be positive when no other evidence is obtainable.—(G. F. C.)

KRUMBHAAR, E. B., AND MUSSER, J. H., Jr. **Diagnostic value of percutaneous tuberculin test (Moro).** Amer. Jour. Med. Sciences, April, 1914.

The authors give the following summary:

1. In 76 unselected nontuberculous cases only 5 failed to give a negative reaction, and in only 2 of these was the Moro positive.

2. Of 24 cases in the first two grades of pulmonary tuberculosis all reacted positively, indicating as is generally accepted the specificity of the reaction.

3. Of 10 cases of far-advanced pulmonary tuberculosis 9 reacted negatively and 1 doubtfully positively.

4. Of 10 tuberculous cases, other than pulmonary, all reacted positively.

5. Of 28 clinically doubtful cases, by the Moro test 7 reacted positively, 6 doubtfully, and 15 negatively. In the 16 cases in which von Pirquet tests were also made, 9 negative Moro cases gave 7 positive and 2 doubtful von Pirquets, while 1 doubtful Moro gave a positive von Pirquet. The others tallied with the Moro tests.

Conclusions:

1. In the light of the above figures, reinforced by the opinions of others, we believe to be erroneous the prevalent opinion that positive reactions in adults are of little or no value.

2. The constantly positive reaction in all undoubted early and moderate cases of tuberculosis is a strong indication of the specificity of the reaction.

3. The negative reaction in 90 per cent of the far-advanced cases indicates that after bodily resistance has been overcome, with the probable disappearance of antibodies, the tissues fail to react to the test.

4. As well as in pulmonary tuberculosis, the test is of value in the differential diagnosis of pleural effusions, joint diseases, abdominal tuberculosis *versus* typhoid, etc.

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5. A general anaphylactic reaction, according to Chiaravalotti, as shown by an increase in the number of leucocytes in the peripheral blood following application of the test is not demonstrable.

6. The test may be repeated on the same patient without alteration of the results. Although in our series the results were in every case the same, rare instances have occurred where repetition produced a different result.—(G. F. C.)

CROFTON, W. M. **Some causes of failure of vaccine therapy.** Lancet, Apr. 4, 1914.

The author discusses failures under four headings, as follows:

(1) Failure of patients to react. He notes that old people or those suffering from diabetes, acidosis, chronic nephritis, or cachexia respond poorly. In such cases only small doses should be used.

(2) Failure properly to diagnose the organism producing the condition.

(3) Failures from insufficient dosage. He states that there is no fixed upper limit of dosage, but that dosage should depend on the response of the patient. He has given up to 30,000 million staphylococci in a case of staphylococcus septicemia; up to 8,000 million of a mixed vaccine of streptococcus and *M. catarrhalis* in a case of Riggs's disease.

(4) Failures from giving vaccines at regular intervals. He begins with small doses—for instance, 100 million staphylococci, at short intervals, 48 hours (three days intervening after cessation of any reaction, if such should arise), and gradually increases the dosage, as well as the time between doses, so that in giving very large doses he sometimes waits 14 days or longer.—(G. F. C.)

THEILE, F. H., AND EMBLETON, D. **A method of increasing the accuracy and delicacy of the Wassermann reaction.** Lancet, Apr. 11, 1914.

The authors recommend the use of acetone-insoluble antigen prepared from beef heart, which has been allowed to autolyze, at room temperature, for 24 to 36 hours. The antigen is tested for (1) hemolytic action, (2) anticomplementary action, and (3) antigenic action.

Complement and amboceptor are titrated before each test. For the test $1\frac{1}{2}$ units of complement; 2 units of amboceptor; 0.1 c. c. of a 1 to 10 dilution of antigen; 0.1 c. c. of 10 per cent suspension of red cells; and various amounts of the serum to the tested, in a series of tubes (from 0.1 to 1.0 c. c.), are used.

Controls with known syphilitic serum, known normal serum, and without serum are used.

They state that cholesterin does not increase the antigenic power of an antigen, but does increase the anticomplementary power of any serum either normal or syphilitic.—(G. F. C.)

CHEMISTRY AND PHARMACY.

E. W. Brown, passed assistant surgeon, and O. G. Ruge, chief pharmacist, United States Navy.

Matko, J. **Quantitative test of pancreatic function.** Arch. Verdannungskrank., 19, 663-73.

This test demonstrates whether the pancreas is secreting an excessively high or low quantity of pancreatic juice or whether conditions are normal. The previous evening a liquid meal is eaten and 15 gms. of Karlsbad salts in 400 c. c. of water. For the morning meal the patient consumes a lean chop weighing 130–150 gms. and 0.3 gm. of carmine. He receives 15 gms. of Karlsbad salts in 200 c. c. of water one-half hour later and then 200 c. c. more of water alone. The complete stool of this day is collected and the portions with carmine stain united, measured, and filtered. The filtrate is tested for trypsin by its capacity to digest casein in a set of graduated tubes. The results are always computed by the total quantity of stool and not by proportion in the test tubes alone.—(E. W. B.)

Dehn, W. M., and Hartwell, F. A. **A comparison of various preservatives of urine.** Journ. Amer. Chem. Soc., 36, 409–417.

The authors have exhaustively searched the literature of the subject and have carried out an elaborate series of experiments. The findings are as follows: (1) The ideal preservative must be soluble, nonvolatile, and neutral or slightly acid; (2) different preservatives must be used for different purposes; (3) none of the preservatives has complete bactericidal power in the concentrations used; (4) salicylic acid is the most satisfactory preservative of those studied; it does not interfere with the estimation of sugar by copper solutions; (5) chloroform is a good preservative for urea and ammonia, but is inefficient with glucose, creatinine, and chlorine; (6) thymol affects the accuracy of glucose, uric acid, and creatinine estimations; (7) boric acid is of little value; (8) ether preserves well in large amounts, but interferes with volume relations; (9) formalin precipitates urea and is a reducing body itself; (10) hydrogen peroxide interferes with many urine reactions and is ineffective; (11) toluene preserves uric acid and creatinine well.—(E. W. B.)

Kleiner, S. B. A clinical method for the rapid estimation of the quantity of dextrose in urine. Journ. Amer. Med. Assoc., LXII, 1914, pp. 1307–1308.

This is a calorimetric method, is very simple, and requires from 10 to 12 minutes for an estimation. The apparatus, which is simple and easy to procure, is as follows: (1) A small graduated cylinder; (2) a 1 c. c. pipette; (3) a 7-inch test tube; (4) a set of ordinary 2-dram homeopathic vials; and (5) one extra vial.

Benedict's solution is used for the reduction; it keeps indefinitely and is inexpensively and easily prepared, as follows: 173 gms. of sodium citrate and 100 gms. of anhydrous sodium carbonate are dissolved in about 800 c. c. of distilled water; 17.3 gms. of copper sulphate are now dissolved in 100 to 150 c. c. of water and added to the above 800 c. c.

The procedure is as follows: To 15 c. c. of the Benedict's reagent, 1 c. c. of urine is added from the 1 c. c pipette, the mixture is put in the 7-inch test tube and is boiled 4 minutes. It is then filtered; 5 c. c. of the filtrate and 1 c. c. of strong ammonia solution are placed in the extra vial. In the boiling a certain amount of copper is reduced, leaving amounts of unreduced copper in the solution corresponding inversely to the amount of sugar in the urine sample. The strong ammonia gives a deep blue color, thus facilitating the comparison of the unknown with the known solutions in the standard vials. These standards are prepared by the reduction of water solutions of glucose of 0.0, 0.5, 1.0, 1.5, 2.0, and 2.5 per cent, in the same manner as in the above procedure. The color comparison will show, for instance, whether the urine contains 0.5 per cent or 1.0 per cent of glucose.

Comparative estimations with the fermentation and polariscopic methods show that the present plan is accurate for clinical purposes.—(E. W. B.)

EYE, EAR, NOSE, AND THROAT.

E. J. Grow, surgeon, and G. B. Trible, passed assistant surgeon, United States Navy.

Fourrière. Intra ocular pressure. Annales d'Oculistique. January, 1913.

The normal tension of the human eye is between 16 mm. and 25 mm. The tension of the eyes in cases of anisometropia is equal, showing that in otherwise normal eyes anomalies of refraction have no influence on the tension.

Massage or repearted measurements of the tension, cause reduction of tension. Holocaine (2 per cent) causes no alteration of tension. Cocaine may cause a very slight increase or decrease of tension.—(E. J. G.)

Butler. "Strauma" as an important factor in diseases of the eye. British Medical Journal, Oct. 18, 1913.

He attaches importance to the family history and clinical appearance of the diseased organ. He unconditionally sets aside the Calmette reaction on account of the danger entailed by its use. A negative von Pirquet is of very much more value than a positive. Of the three kinds of reaction that may follow the injection of old tuberculin (focal, local, and general), the first named is by far the most important in eye work, since it indicates the actual presence of the bacilli in that organ.

Bacillus tuberculosis is the prime factor in the causation of scleritis. Some 30 per cent of the cases of interstitial keratitis are of tubercular origin. Year by year the author becomes more and more sceptical as to the existence of a "rheumatic" or "gouty" iritis. He regards tuberculin as a valuable remedy in the treatment of attenuated tuberculosis, although care is to be exercised in its use. If the local focus in the eye forms but a part of a widely spread tuberculosis, he believes that its use is apt to be harmful, and the same is true when a state of anaphylaxis is present. It is sometimes necessary to exercise patience, as no improvement is manifest for weeks or even months.—(E. J. G.)

Wibo. Carbonic cauterization in the treatment of granular ophthalmia. Annales d'Oculistique, March, 1913.

He considers that applications of carbonic-acid snow are destined to take a prominent place in the treatment of trachoma. After cocaining the eye he applies a pencil of the snow to the diseased areas of the everted conjunctiva for from 15 to 20 seconds, according to the severity of the lesion. He reports several cases giving satisfactory results.—(E. J. G.)

Reeder. Ocular and other complications of syphilis treated by salvarsan. Med. Press and Circular, March 4, 1914.

His conclusions are, from a study of the literature and from cases he has observed, that salvarsan is inadequate to cure all cases of syphilis, and that one dose is not sufficient in any case; that where administered in selected cases it is probably harmless, and that most of the by-effects are due to the disease and not the drug. It will prove of great benefit in cases of fulminating syphilitic iritis, but mercury and iodides should be also given when the patient is on the road to recovery. It is not wise to depend upon salvarsan for a cure.—(E. J. G.)

ULRICH H. L. **Some notes on hay fever.** Journ. Amer. Med. Assoc., Vol. LXII, No. 16.

Accepting a pollen toxicosis as an etiologic basis, the method of treatment followed by the author is as follows:

A 5 per cent suspension of pollen in distilled water or salt solution is made and is subjected to alternate freezing and thawing. Clowe's method of removing the oily envelope with acetone and then extracting may also be used.

Subcutaneous injections of very dilute extracts were given at intervals of one, two, and three days. The usual dose was 0.5 c. c. of a dilution, never greater than 1 to 500,000 nor less than 1 to 1,000,000. The author confined himself to ragweed pollen, since from prolonged observation he found that it was the only flowering plant which has a wind-borne pollen from July 1 to September 15. Golden-rod pollen is not wind borne and is very difficult to remove from the blossoms without vigorous shaking.

Twelve cases were reported with the following clinical results:

1. The patients were relieved partially or wholly from symptoms in from 15 minutes to 2 hours. This relief lasted sometimes a few hours, again for days. (One week was the longest.)

2. There was a gradual improvement of symptoms in the majority of cases, which can not be explained wholly by a diminution of pollen in the air.—(G. B. T.)

LATHROP, O. A. **A radiographic study of the mastoid.** Boston Med. and Surg. Journ., Vol. CLXX, No. 10.

The total number of mastoid pictures tabulated was 460. The number of pathological mastoids was about evenly divided between left and right. In cases with a clinical diagnosis of chronic suppurative otitis media, 94 per cent showed total sclerosis of the mastoid and 6 per cent semisclerosis.

In general, the use of the X-ray plate promises to be of great use in the differential diagnosis between acute mastoiditis and an acute exacerbation of a chronic sclerosed mastoid. More minute changes are shown by the X-ray than by transillumination, while transillumination is, in the author's opinion, more accurate in the antrum of Highmore.—(G. B. T.)

VERGUES. **Ear complications during typhoid fever.** Archiv. de Med. et de Phar. Mil., July, 1912.

In 359 cases of typhoid under consideration otitis externa was found in only two cases and was not typical, being probably the result of debility.

Otitis media was the most frequent complication present in the acute catarrhal form in 2.7 per cent of cases and for the most part clearing up without passing to the suppurative form. Acute catarrhal otitis media occurred more frequently in the first week.

Purulent otitis media occurred in 4.4 per cent and was the most frequent complication. The bacterial agents found in the pus were *Bacillus coli*, the streptococcus, staphylococcus, and diplococcus, but in no case was there present the bacillus of Eberth, either in pure culture or associated with other forms. In general, these cases had a milder and less painful onset and course than the usual acute suppurative otitis media. Mastoid involvement was found to be a relatively frequent complication.

The most important causative factor in the production of acute suppurative otitis media in typhoid cases was found to be the bucco-pharyngeal infection, so frequent in typhoid.

Otitis interna: Not a single case was found in this series. It probably existed as a light involvement of the auditory nerve and was passed unnoticed by the patient.—(G. B. T.)

CITELLI. **Su di un di piccola sanguisuga cavallina nel bronco destro e su 7 casi di grosse sanguisughe cavalline in laringe in trachea e rino-faringe.** Bollettino delle mal attie dell' orecenio, etc., December, 1912.

A peasant of Catania, after having drunk at a spring, began to have blood in the sputum. After 15 days the blood persisted and there was itching in the throat and a cough, so he sought medical assistance. Ordinary examination revealed nothing, but superior bronchoscopy showed a little leech at the beginning of the right bronchus. This was removed with forceps. Owing to the tenacious hold secured by the leech, its removal without the aid of a bronchoscope would have been impossible.

In the other seven cases the leeches were located, four times in the pharynx, twice at the beginning of the trachea, and once in the naso-pharynx.—(G. B. T.)

REPORTS AND LETTERS.

AMERICAN MEDICO-PSYCHOLOGICAL ASSOCIATION.

By R. F. SHEEHAN, passed assistant surgeon, United States Navy.

The seventieth annual meeting of this body was held in Baltimore May 26, 27, 28, and 29, 1914. There was an unusually large attendance, including the foremost psychiatrists of the United States and Canada. In conjunction with the meeting there was an interesting competitive exhibition by various hospitals of diversional and occupational methods. Particular stress was laid upon the development of the idea of psychopathic hospitals and wards in general hospitals.

On the two days previous there occurred the annual meetings of the State Societies for Mental Hygiene and the National Association for the Study of Epilepsy, both of which were well attended.

The annual address by invitation was given by Llewellys F. Barker, M. D., professor of medicine, Johns Hopkins University, the title being "The Relations of Internal Medicine to Psychiatry." This paper was greatly appreciated, being an excellent example of the wonderful productivity and versatility of the distinguished author.

The scientific program was large, including about 20 set papers. They were all of import, but space will permit notice only of some of them. The symposium on general paralysis provoked considerable interest and discussion. It included the following papers:

"GENERAL PARALYSIS AS A PUBLIC HEALTH PROBLEM." BY THOMAS W. SALMON, M. D., NEW YORK: General paresis as a cause of death compared with some other preventable diseases. Examination of the data available: (1) Paretics who die from general paresis; (2) paretics who die from other causes. Comparison of causes of death in general paresis in State hospitals with causes in the community as a whole. Deaths from unrecognized general paresis; in which mortality groups are we most likely to find them? Examination of the data available; some suggestions for estimating the number of cases of general paresis from the mortality statistics. Statement of the problem with reference to the foregoing considerations. Outline for preventive measures: (1) Preventing well persons from having syphilis; (2) preventing syphilitics from having general paresis.

"The Pathology of General Paralysis." By Charles B. Dunlap, M. D., New York: What, pathologically speaking, is included at present in the term "general paralysis"? The position and distribution of characteristic tissue changes determine the presence or absence of general paralysis, rather than the type of cell, or the presence of an inflammatory or degenerative reaction. General paralysis spares no part of the central nervous system. The relationship of general paralysis to certain forms of late cerebral syphilis is close. The histological varieties of general paralysis are many, and the histological boundaries of this disorder are not wholly clear. Anatomical reasons for difficulty in clinical correlation include positive findings in remissions, cases without symptoms, etc. Histologically the possibility of rare spontaneous arrests, or even recoveries, is not wholly to be excluded. The bearing of the pathological anatomy on treatment. The frequency of occurrence of the specific organism and its location in general paralysis. Curative measures are most welcome, but the anatomical lesions would suggest that prophylaxis is the great hope of the future.

"The Diagnosis of General Paralysis." By Adolph Meyer, M. D., Baltimore: The diagnosis of general paralysis probably has its best differential point to-day in the gold-chloride reaction. It is, however, absolutely necessary to differentiate more carefully than ever the neurological and psychobiological symptom-complexes, so as to establish groups with differences with regard to treatment and with regard to course of the disease and according to different distribution of the lesion. The differential difficulties of the tabetic symptom-complex, the cerebral symptom-complex, the focal type, and the cases with epileptiform reactions deserve special discussion, in the light of the several types of syphilitic reactions of the nervous system, toxic states (bromide poisoning), and tumor effects.

"The Treatment of General Paralysis by Salvarsanized Serum." By Henry A. Cotton, M. D., Trenton: During the last year 20 cases of paresis have been treated by combined intravenous and intraspinous methods. Description of method. Dangers to be avoided. Contraindications. Treatment must be persistent and continuous. Of the 20 cases, 2 show now no evidences of paresis, either clinical symptoms or biological reactions; 10 cases are improving, 6 of which may be arrested; 3 cases show no improvement; 5 cases have died during treatment. All types of paresis have been treated, the last stages as well as the first. Classification of types. Results to be expected. Illustrative cases. Lantern slide demonstration.

"A Report on Five Cases of Intracranial Injection of Autoserosalvarsan." By Drew M. Wardner, M. D., Cedar Grove:

A description of the technique employed; abstracts from the histories of the cases treated, and conclusion as to the value of the treatment.

"The Spirocheta Pallida in the Brains of Paretics." By Joseph W. Moore, M. D., Beacon, N. Y.: Remarks on the location of the organism in the brain tissues and its bearing upon prognosis.

The part of the program that caused quite spirited discussion was that having to do with psychoanalysis, the papers being criticisms of things Freudian. In the discussion the cult was ably defended, among others by William A. White, of Washington, D. C. He likened the opposition to this "dissection of the mind" to that which early met dissection of the body and the discovery of Galileo. He bespoke a judicial attitude toward the method. He also stated that it would tend more to elucidation of this problem if instead of bringing forth objections, many of which were groundless, the opponents would interpret the facts that had been determined by the method, for there were facts that demanded logical explanation. Dr. White's remarks were not at all controversial, but merely an appeal for an impartial consideration.

"A Criticism of Psychoanalysis." By Charles W. Burr, M. D., Philadelphia: A short statement of the fundamental ideas underlying psychoanalytic treatment, together with an outline of Freud's theories concerning the interpretation of dreams; a criticism of the above and a statement of some of the possible dangers resulting from psychoanalysis.

The discussion was opened by Francis X. Dercum, M. D., Philadelphia, Pa., by invitation. Among the other papers of interest were the following:

"Gross Findings in Brains of Manic-Depressive Subjects." By E. E. Southard, M. D., Boston: This study deals with the brains of manic-depressive subjects from the same source and with the same methods as in the study of brain findings in the dementia precox group presented to the American Medico-Psychological Association in 1910.

"Clinical and Anatomical Analysis of Eleven Cases of Mental Disease Arising in the Second Decade, with Special Reference to Cortical Hyperpigmentation in Manic-Depressive Insanity." By Earl D. Bond, M. D., Philadelphia, E. E. Southard, M. D., Boston: This study is an application to the material in the second decade of a method already adopted for the sixth and seventh decades (Southard and Mitchell, American Medico-Psychological Association, 1908), and the fifth decade (Southard and Bond, American Medico-Psychological Association, 1913).

"Is There an Increase Among the Dementing Psychoses?" By Charles P. Bancroft, M. D., Concord, N. H.: Statistics on increase

of insane not always reliable. Diagnostic value of symptoms not as great as formerly. Reports of earlier alienists more hopeful. Apparent increase in paresis, dementia precox, various imbecilities, presenile and senile dementia. Probable real increase in paresis only. Increase of syphilis in community. Age limit unreliable as a determining diagnostic factor. The passing of dementia precox. Increase in presenile and senile dementia problematical. Fundamental conditions probably same now as 50 years ago. Existence of an inherent individual tissue durability.

"CLINICAL STUDIES OF BENIGN PSYCHOSES." BY AUGUST HOCH, M. D., AND GEORGE H. KIRBY, M. D., NEW YORK: Description of certain clinical pictures and clinical features, the latter more particularly in reference to the content of the psychosis not usually included in the description of manic-depressive insanity. Attempt at formulating certain principles.

"WHAT IS PARONOIA?" BY E. STANLEY ABBOT, M. D., WAVERLEY, MASS.: Brief reference to the older conceptions. Kraepelin's decription. Some recent interpretations. Outline of two cases, one reported by Bjerre, the other under the observation of the author. The nature of the fundamental mechanism; its resemblance to that of prejudice. Certain relations between error, prejudice, and delusion. Limitation of the term "paranoia." Concluding conception of paranoia.

"RECIDIVATION AND RECOMMITMENTS IN MENTAL TROUBLES." BY GEORGE VILLENEUVE, M. D., MONTREAL.: A study from 5,450 cases admitted from 1885 to 1904; of recommitments up to December 31, 1913; of those discharged as cured, in order to test the reliability of recovery in insanity.

"THE MODERN TREATMENT OF INEBRIETY." BY IRWIN H. NEFF, M. D., FOXBOROUGH, MASS.: The modern conception of habitual drunkenness demands that there be developed a practical method of handling such cases. Any system proposed which is put into practice must be sufficiently elastic so as to permit of its universal adoption. State care is preferable and a centralization of authority is essential. The carrying out of the purposes of any plan should be authorized and controlled by the medical profession. All the details of such a plan, both preventive and curative, should be censored by medical experts before submission to the public for approval and adoption. Any institution built for the care and treatment of drunkenness should be constructed so as to meet the selective requirements of these people; it should also allow for regional departments directed by the parent institution, which should be considered the administrative head. A description of the Massachusetts plan for the care, treatment, and study of drunkenness, its scope, control of administration, and cooperation with allied interests.

"The Present Status of the Application of the Abderhalden Dialysis Method in Psychiatry." By Samuel T. Orton, M. D., Philadelphia: Brief consideration of the theory and application of the dialysis method. Promising results reported by early investigators. Less specific findings in more recent reports. Consideration of possible sources of error.

"Applied Eugenics." By Sanger Brown, M. D., Kenilworth, Ill.: Defined as the regulation of reproduction in accordance with the laws of heredity. Summary legislation requiring prenuptial medical certification is inadvisable. No one, under any circumstances, should be compelled to submit to a specific sterilizing operation. Society can not safely sanction the performance of a specific sterilizing operation upon women who might seek it on the ground of hereditary taint. Criminals from defect should be encouraged to submit to sterilization. Education is the essential agent which must be relied on to render the laws of heredity effective in the promotion of applied eugenics.

"Insanity with Cerebral Disease." By H. P. Sights, M. D., Hopkinsville, Ky.: I have chosen this subject with a view of expressing my opinion as to the relative number of cases to be compared with the various forms of insanity, believing, as I do, that so many conditions that produce this disease are overlooked until they have progressed so far as to render the case hopeless. The object of the paper is to discuss further the anatomical conditions that make it favorable for numerous diseases to spend their force and do their greatest damage to the brain. It will be further asserted in this paper that certain specifics used in the treatment of lues result in the production of this serious mental trouble, adding to the already large percentage of insanity due to cerebral disease.

"Epileptic Dementia." By Alfred Gordon, M. D., Philadelphia: Eight patients have been kept under observation for a period of 12 years; two of them developed mental disturbances early in the course of their epileptic seizures; six began to show signs of mental enfeeblement three or five years after the onset of the original disease. Characteristic features of epileptic dementia.

"The Translation of Symptoms into Their Mechanism." By Chester L. Carlisle, M. D., Kings Park, N. Y.: The formal presentation of symptoms tells us nothing as to the development of particular reactions unless approached from the viewpoint of psychoanalysis. When so approached we find always an affect-complex representing a conflict to which the patient is no longer able to make readjustment. The psychosis represents a retreat into a state of wish fulfillment in a broad sense. Prognosis is affected in proportion to

the extent to which the patient is able to make readjustment to the facts of life after the submerged complex has been brought fully into consciousness.

REPORT OF ELEVEN CASES OF ASPHYXIATION FROM COAL GAS.

By L. C. WHITESIDE, passed assistant surgeon, United States Navy.

On March 16, 1914, on board the U. S. S. *Jupiter*, there occurred 11 cases of asphyxiation from coal gas. This occurred when three ordinary seamen went into the after hold to get some coal for the galley. The hold had not been opened for six days, and was about one-third full of bituminous coal. This coal had been put into the hold while very wet, on February 9, 1914, and the hold had been opened only once before March 16, 1914, at which time there were no signs of the presence of gas. The men went into this hold through a manhole, the large hatch being unopened. Of the three, one man was overcome by the gas immediately on reaching the level of the coal. One of the other men went back on deck to get help, and on returning in about five minutes found the third man prostrate in the hold. The rescue party went down into this space through the same opening, being unaware of the poisonous nature of the gas. In the meantime the hatch cover was raised, facilitating work of the rescue party on deck. By this time seven men had been overcome. The average time of succumbing after reaching the coal level was about two minutes. The other four men were affected to a lesser degree, being overcome during the rescue work.

Of the 11 men, there were 7 who were in very bad shape. These were stripped, laid on deck, and artificial respiration by Sylvester's method was done. A pulmotor was procured at once from the United States naval hospital, Mare Island, Cal., and oxygen inhalations given to all of these men. The two men who had been overcome at the first had been in the hold for about 15 minutes before being rescued. To these it was necessary to give the pulmotor proper. After about two hours' work the men were in condition to move, when they were properly cared for, stimulants, etc., being given.

It was very noticeable that in all of these cases the pulse rate was very high, the general appearance of the body being cyanotic. The forehead and eyelids were markedly swollen and cyanotic when the men were first brought from the hold, swelling disappearing about five minutes afterwards.

As to the nature of the poisonous gas, it is believed to have been carbon monoxide. As the coal was placed in the hold wet, with practically no ventilation in the space, it is very reasonable to assume

that uncarburetted water gas was formed, the formula of which is as follows:

	Per cent.
H	49.32
CH_4	7.65
CO	37.97
CO_2	.14
N	4.79
O	.13

As will be seen by this formula, the percentage of CO is very high. Woodman's blood test for CO proved positive. It is very significant that on March 18 a slow, smoldering fire was discovered deep down in the body of this coal, necessitating its removal.

EXTRACTS FROM ANNUAL SANITARY REPORTS FOR 1913.

UNITED STATES NAVAL ACADEMY, ANNAPOLIS, MD.

By A. M. D. McCormick, medical director, United States Navy.

From the small percentage of sick, 0.44 for the year, it will be seen that preventable diseases have almost entirely been excluded from the brigade of midshipmen, and remarkably little damage was done by communicable diseases, which is a matter of congratulation, as the academy and the city of Annapolis are intimately associated, and, as there is no organized health department in the city, contagious diseases can be readily introduced. There are no general sanitary regulations and no placarding of houses for contagious diseases, and, judging by the measures taken in an outbreak of smallpox during the year, there is a state of unpreparedness in the matter of dealing with epidemics. Several widely scattered foci of smallpox occurred in the city, but there was no house-to-house inspection or general vaccination. One case occurred on Hanover Street, in a house opposite the officers' mess. As it was proposed to treat this case in the house, it gave the medical officers of the academy some concern, so a recommendation was made that the assistance of the Public Health Service be asked in dealing with the situation. The case in question was promptly removed in an automobile to the Baltimore pesthouse. As a result of the prevalence of smallpox in Baltimore and its appearance in Annapolis, a general vaccination was made of all enlisted men, employees, and servants who might be exposed to the contagion, 2,455 persons in all being vaccinated.

The good health of the midshipmen has been undoubtedly due in a large measure to the clean milk, pure water, and good food with which they are provided. The last milk examination, made December 31, 1913, gives a bacterial count of 1,100 to 2,700 per c. c. Some

States allow 10,000 and some 30,000 for certified milk, and any milk under 100,000 in New York City is graded in class A and is not required to be pasteurized, so it seems that a very pure article is furnished the midshipmen and practically all children on the station. At the time of the last inspection of the dairy, made December 27, 1913, by the representatives of the Bureau of Animal Industry, the equipment was noted as 39.78 (maximum, 40), methods, 57.85 (maximum, 60), a final score of 97.63 out of 100. Comparing this with the inspections of the ——— dairy, which scored about 50, it is seen that much has been accomplished for the maintenance of health and the abolishing of disease. Now that a farm has been bought for dairy purposes and for growing vegetables, etc., for the midshipmen's mess, it is assured that the good work will go on. The pure water is obtained from driven wells, 600 feet deep. The meat used is Government inspected and great care is used in buying all other foods.

U. S. S. ARKANSAS.

By W. B. GROVE, surgeon, United States Navy.

As usual venereal diseases headed the list. To prolonged liberties in and around Naples was due the larger proportion of these cases.

Venereal prophylaxis as practiced is not productive of all the results hoped for, as has been noted before. Treatment too long after exposure is the main cause of failure. It is suggested that a combination of the present system, with free prophylactic tubes at sick bay, and loss of pay for time lost to the service from venereal disease should be considered.

Distribution of the prophylactic tubes should be in the hands of the Medical Department in order to keep proper records, and unless there is a change from the present system their sale in the canteen only serves to complicate matters.

There is a preparation on the market which is understood to be favorably considered by the Bureau of Medicine and Surgery which is so cheap that its cost is not much greater than an application of the present prophylaxis. It therefore seems that best results could be obtained by issuing the tubes free at the sick bay, because it is believed a greater number of men would use them, and instructions could be given as issued. Retention of the present system (plus pay, as suggested) is intended to supplement the use of prophylactic tubes.

While this ship was in the yard during March, April, and May last, a radical change was made in the ventilating system of the engine rooms. The large engine room hatches for natural ventilation

were closed and in their place four large exhaust fans were installed on the third deck, two on each side.

The chief complaint under the old system was excessive temperatures of 120° to 130° F. in the engine rooms when under way in the Tropics. Under the new system the hot air is removed so rapidly that temperatures higher than 90° F. have not been observed, although precisely the same extreme external climatic conditions have not been encountered. The highest temperature reading during the full power trials last June was 86° F. The carbon dioxide and humidity at the same time were very low.

It is not too much to say that since the change was made, the engine-room force has been working under very satisfactory conditions. While the benefits derived from the change have been very marked, it should not be forgotten that no piece of machinery has yet been devised that is not liable to at least a temporary breakdown, and that by doing away with all natural ventilation a stoppage of the exhaust fans would render the engine rooms uninhabitable. Experience alone can finally determine the wisdom of the change when working under the extreme conditions and stresses which it is the ultimate object of a ship to meet successfully.

The question of airing bedding has not received the attention it deserves. The fleet routine calls for airing of bedding once a week, which is not sufficient, weather and other circumstances permitting. Routine should call for more frequent exposure. It has been noted that in following routine, bedding has been exposed on days so damp that no possible benefit could accrue, and an increase in colds and tonsillitis must surely result. On this ship when the appointed day was not favorable, exposure was suspended, and special permission obtained to air bedding at other times.

MARINE BARRACKS, CAMP ELLIOTT, CANAL ZONE, PANAMA.

By B. H. DORSEY, passed assistant surgeon, United States Navy.

The mosquitoes have greatly increased with the increase of stagnant water surrounding the camp, backing up from Gatun Lake, and an increase in the malaria rate is to be expected.

All the cases of malaria responded nicely to quinine and deserve no special mention. There was one marked case of cinchonism from quinine. Patient came in with history of chill, slight fever, and estivo-autumnal parasites in the blood. Ten grains of liquid quinine were given three times a day. About half an hour after the first dose of quinine his temperature jumped up about 3°, pulse was rapid and feeble, marked cyanosis about face and fingers, nausea, vomiting.

pupils dilated, and a general urticarial rash over body. Quinine was discontinued, this condition passed off, and his malaria was treated with euquinine. This acted well with no bad effects, and the man was transferred back to the United States.

A case of cocaine poisoning was of interest. About 10.55 a. m. the man came running into sick quarters, irrational, delirious, and with hallucinations. The pulse was rapid and feeble, pupils dilated. It was impossible to get any history from him. He was put to bed and went into epileptiform convulsions and died in about 15 minutes. No gastric or corrosive symptoms present. Evidence obtained from his shack mate was conclusive that he had been a cocaine habitué for some time and was seen the night before snuffing a white powder up his nose. A few needle marks were on his arms, and his nasal fossae were greatly inflamed with erosion of septum. The morbid anatomy found at the autopsy revealed nothing definite, but chemical analysis of urine, blood, and bile revealed an alkaloid resembling cocaine.

U. S. S. CINCINNATI.

By J. B. Mears, passed assistant surgeon, United States Navy.

At one time the storerooms and pantries became infested with roaches, and the ordinary insect powders seemed to have no effect on them. Sodium fluoride was then used with marked result. Not only were the roaches killed, but also the ordinary black beetle that is found with the roaches.

Manila had an outbreak of plague in the spring and sporadic cases have occurred at intervals since then. Cholera also appeared in Manila during the summer and quite an epidemic followed, which was not under control until about a month ago. A few cases of both diseases have been reported from a number of smaller cities in the islands. Cebu had three cases of cholera about a month before the ship visited that port.

One death occurred on board. While clearing the ship for action in target practice a seaman was crushed between an anchor davit and the ship and died within a few minutes. Autopsy showed a rupture of the inferior vena cava extending into the right auricle of the heart, a rupture in the right lower lobe of lung, a rupture in the liver, and fracture of three ribs.

The Southern Islands Hospital at Cebu is a new institution and under Government control. It is a very pretty two-story building, with four wards, which can be enlarged at any time. At present it has accommodation for 40 patients. The equipment has not been fully installed as yet, but enough has been installed for general surgical work. Native nurses, male and female, are employed, under the supervision of an American nurse.

U. S. S. FLORIDA.

By M. S. Elliott, surgeon, United States Navy.

During the overhaul period a portion of the crew lived in camp in the navy yard. This was a most excellent idea as it removed a number of men from the ship when it did the most good. The men slept and ate in the camp and were marched to and from the ship for their regular duty. The camp was under the immediate command of the marine officer and was regularly inspected by the commanding officer and the medical officer. Advantage was taken at this time to instruct the men in first aid, personal hygiene, etc., both by the medical officers and the line officers. During the three months that the camp was occupied, no cases of illness occurred except of a very trival nature and none was admitted to the sick list.

This procedure in ships undergoing overhaul is worthy of general adoption. Its benefits are self-evident. The camp was completely equipped from the ship. Tent floors, kitchen, dining tent, etc., were supplied with necessary lumber from the scrap heap in the yard.

Venereal prophylaxis: The present system is a failure. It is followed consistently by the men, but in the majority of cases too long a time elapsed between exposure and returning to the ship. During the visit of this ship to Naples, 45 cases of venereal disease were contracted. All of these cases took prophylaxis on return to the ship, but as most of them were absent from 48 hours to 10 days its uselessness is apparent.

NAVAL TRAINING STATION, GREAT LAKES, ILL.

By J. S. Taylor, surgeon, United States Navy.

Smallpox vaccination: The proportion of recruits arriving here without evidence of previous vaccination is alarmingly large, and shows the general and growing indifference that prevails in many sections of our country to this important hygienic measure. Great pains have been taken to vaccinate successfully every unprotected recruit.

Venereal diseases: Strenuous efforts to eliminate venereal diseases on the station have been made by the medical officers, seconded most cordially and efficiently by the authorities of the station. The following measures were taken: A special place was assigned and fitted out in barracks for administration of prophylactic treatment for the permanent station force, and a nurse detailed to be present at a convenient hour each day to assist administration of same. A separate place was arranged for the apprentice seamen. After a considerable period had elapsed without the permanent station force having made any use of the venereal prophylaxis, the special station for them was

abandoned. The station force and the seaman guard had been duly instructed on the venereal peril and urged to use prophylaxis by a medical officer. Every recruit arriving on the station has received careful instruction on the subject of venereal diseases. The aim has been to set forth in some detail the nature of these diseases and their far reaching and lasting effect upon health, happiness, and success in the service and throughout life. Any appearance of trying to restrain from improper sexual indulgence by inspiring fear was carefully avoided, and stress was laid on cultivating a healthy, active body, keeping the thoughts off dangerous topics, the avoidance of alcohol, vulgar shows, vile books and pictures, and dirty stories as the principal excitants of sexual desire. The modes of infection, the general course and symptoms and the complications and consequences of venereal disease were fully set forth.

Shoes: For a while complaints of disability from corns, bunions, and sore feet were so frequent that authority was obtained to have a hospital steward present when the recruits were outfitted after their arrival to see that shoes of sufficient length and width were selected in every case. The steward was given the little volume by Maj. Munson, Medical Corps, United States Army, to read, and directed to insist on issue of large enough shoes in every case, but more particularly where corns and bunions existed. Since this routine practice was established the number excused for this class of disturbances has been reduced to zero.

NAVAL STATION, GUAM.

By C. P. Kindleberger, surgeon, United States Navy.

In spite of the recent epidemic of measles and mumps and the increased activity of chicken pox during the last 18 months, the general health of the natives of Guam, as shown by the increase in population, can be said to have gradually improved during the past five years. This is due, first, to the establishment of water works, sewers, public latrines and showers, efficient street cleaning, and incinerators for garbage and refuse, in Agaña; second, to the establishment of water works and public latrines and showers in a number of the smaller towns; third, to the course in general and personal hygiene given in the public schools; fourth, to the gradual reduction of the mortality of infants and children, due (*a*) to the establishment of licensed educated midwives, (*b*) to the instruction of parents concerning their proper care and feeding and the vital necessity for promptly bringing sick children to the hospital for treatment, (*c*) to the repeated systematic treatments of children of school age for intestinal parasites; fifth, to the segregation of lepers and insane and

the deportation of the former to Culion, P. I.; sixth, to the compulsory treatment of all cases of gangosa; seventh, to strict quarantine, when necessary, of all classes of passengers arriving in Guam.

Intestinal infections and parasites: Practically every native adult and child is infected with from one to five species of intestinal parasites. The soil under and around the houses, dust found inside the houses, and dirt from finger nails have been examined and found to contain ova of from one to three intestinal parasites. The children, while playing in the dirt, not only constantly reinfect themselves but frequently, when not watched, contaminate the soil with urine and feces. The lower classes bathe infrequently, wear dirty clothes, have only a few cooking utensils, and usually eat with their hands from a common dish. They practically never clean their nails nor wash their faces and hands with soap and water before eating. On the ranches, where water is usually scarce, conditions are ideal for infection with intestinal parasites. To obviate this water scarcity, the ranch houses should be provided with galvanized-iron roofs and tanks or cisterns to catch the rain water. On the ranches and in the towns, pollution of the soil with fecal matter and urine should be stopped. Ranches should use dry-earth privies; and inhabitants of towns, water-closets or the dry-earth pail system. Adults guilty of soil contamination should be fined. Bamboo screens should be built around the foundations of houses to prevent contamination of the soil under them by children and animals. Except from March 28 to July 18, when there was practically no water in the Fonte reservoir and the dam was being repaired, school children from Agaña and the smaller towns were admitted to ward No. 3 in rotation, for 12 days' treatment for hookworms, roundworms, whipworms, and other intestinal parasites. In addition to this, the stools of all other patients admitted to the hospital for any cause were examined, and, if any ova were found, appropriate anthelmintic treatment was given. Reduction of the almost universal infection with these parasites can be accomplished by the prevention of soil pollution; by educating the children and adults in regard to the methods of infection and means of preventing same; by providing all the smaller towns with waterworks, sewers, public latrines, and baths, and crematories for garbage and objectionable refuse; by the gradual increase in cleanliness of person and clothes; by the use of clean, well-cooked food, pure drinking water, and modern cooking utensils and tableware. Enteritis and enterocolitis, principally due to faulty feeding and indigestible food, are common forms of dysentery and are fairly common in infants and young children, but the number of cases has considerably decreased since waterworks were established in Agaña and some of the smaller towns. During 1913 only one death from dysentery (unclassified) is recorded.

The following routine treatment now used in ward No. 3, has given a greater percentage of negative stools than any plan previously adopted. On admission, the child's weight, age, size, and physical condition are determined and the dosage of thymol and santonin regulated accordingly. Up to 3 years of age, 1 grain of santonin is prescribed; from 3 to 12 years 2 grains; and after 12 years 3 grains. The usual dose of thymol is 1 grain for each year of age, unless this dose is contraindicated by the general physical condition of the little patient.

First day: Full diet for breakfast and dinner; no supper. Mag. sulph. gm. 15; santonin at 4 and 5 p. m.; calomel at 7 p. m.; stool to laboratory.

Second and third days: Full diet for breakfast and dinner; no supper; repeat santonin and calomel.

Fourth day: Full diet for breakfast and dinner; no supper; stay in bed; thymol at 7, 9, and 11 a. m.; mag. sulph. gm. 15 at 3 p. m.

Fifth day: Full diet; one benzol enema in p. m.; mag. sulph. 15 gms. at 6 p. m.

Sixth day: Full diet; one benzol enema in a. m.

Seventh day: Full diet for breakfast and dinner; no supper; same treatment as on first day.

Eighth, ninth, tenth, and eleventh days: Same diet and treatment as on second, third, fourth, and fifth days.

Twelfth day: Full diet; mag. sulph. gm. 10 at 6 a. m.; stool to laboratory and discharge as soon as report is returned.

Full diet: Breakfast—Hard bread, rice, and coffee. Dinner—Hard bread, rice, and meat. Supper—Hard bread, rice, and salmon.

For adults admitted to ward No. 1, the routine treatment for intestinal parasites is as follows:

First night: Ol. ricini 30 c. c. at 9 p. m.

Second day: Mag. sulph. gm. 15 at 6 a. m.; broth for lunch; no supper; santonin grs. 5 at 6 and 7 p. m.; calomel grs. 2½ at 9 p. m.

Third day: Mag. sulph. gm. 30 at 6 a. m; broth for breakfast and lunch; no supper; thymol gm. 3 at 7 p. m. and 8 p. m. Take pulse every hour after 9 p. m.; mag. sulph. gm. 60 at 6 a. m., the next morning, or before if pulse drops to 40.

Fourth day: Full diet. If whipworms are present, give high benzol enema. 1–150, at 5 p. m. and at 6 a. m., for two days; if necessary to repeat enemas for third time, give 1–75.

NOTE.—Santonin and benzol enemas may be given at the same time, but benzol enemas must not be given while there is thymol in the bowel.

Magnesium sulphate, gm. 60, 24 hours after last thymol treatment and send stool to laboratory; if any eggs are present, repeat treatment.

In the few cases in which thymol has failed to give the usual results the following mixture, recommended by Castellani and Chalmers, was prescribed and has proven to be most efficient:

℞	Ol. eucalypti ______	4.0
	Chloroformi ______	6.0
	Ol. ricini ________	80.0

M. Sig: Adult dose, 25 c. c., repeated in half an hour. The dose for children is 8–16 c. c.

Considerable success in ridding patients of whipworms has resulted from the use of four to six high enemata of benzol (C_6H_6), 1–150 to 1–75. In adults the benzol is combined with mucilage of acacia, water, and oil of sweet almonds; in children it is mixed with water and tincture of green soap. The enemata are given only once a day and held from 10 to 15 minutes if possible.

Two children died during the year from hookworm infection in spite of vigorous and continued treatment. The skin assumed a lemon-yellow tint, general edema ensued, somnolence was marked, the red cells finally went below 1,000,000, and the hemoglobin was correspondingly reduced. Postmortem, large numbers of the parasites were found in the small intestine.

Gangosa: Luetin reactions and Noguchi tests were started June 24 on 369 gangosas, the other four being absent in Saipan. From the results of these tests[1] we may conclude that, although the exact origin of gangosa is unknown, the disease is probably a tertiary stage or sequel of untreated yaws, combined in many cases with a more or less strong element of hereditary syphilis. During the recent general physical examination of the inhabitants of Guam 49 new gangosas were discovered and added to the official card index.

All gangosas are ordered to report for examination once a month at the hospital (native clinic) or nearest dressing station. Reports of these examinations are forwarded to the health officer on a special printed form. During 1913 internal (mixed) treatment was given to all cases that needed it. Gangosas with open lesions that proved intractable to treatment, either at the native clinic or dressing stations, were brought into the wards of the hospital for salvarsan, skin grafting, the application of an 8 per cent ointment of scarlet red in vaseline and other necessary internal and local treatment.

Epidemic asthma (guha): This disease usually appears about the end of October. In children the symptoms resemble bronchopneumonia, in adults, asthma. It is most fatal in early life, especially among fat, well nourished infants. A causative organism has not as yet been discovered. The disease is now believed to be partly climatic in origin and partly due to the anemia and toxemia caused by the presence of intestinal parasites; possibly it is caused by some specific microorganism. During 1913 there were 37 admissions, 29 cases treated at the native clinic, and only 8 deaths; in 1912 there were 25 deaths from this disease. The gratifying reduction in the number of deaths is considered to be due to the almost universal worm treatment and to the adoption of the present rational and scientific case treatment.

Frambesia tropica (yaws): It is estimated that about 90 per cent of the natives living in the smaller island towns and rural districts

[1] See page 381.

have yaws in childhood. In Agaña, where hygienic conditions are better, only about 5 per cent are so affected. In February, 1912, Past Asst. Surg. W. M. Kerr examined 2,429 normal natives and found that 1,399, or 57.5 per cent, had had yaws. Though some cases of yaws are quite severe, the natives pay very little attention to them, apparently consider the disease of minor importance, and rarely bring their sick children to the hospital or to a dressing station for treatment unless ordered to do so by a medical officer. Cases are not generally seen in the primary stage, only in the secondary or tertiary stage (gangosa?).

The routine internal treatment is bichloride of mercury and potassium iodide or potassium iodide alone; locally, a 25 per cent solution of silver nitrate is used. In some cases, one or more intravenous or intramuscular doses of salvarsan are also given. As gangosa is now thought to be a tertiary stage or a sequel of untreated yaws, combined in many cases with a strong element of hereditary syphilis, the compulsory treatment of all cases of yaws that may appear in the future will shortly be recommended. As the usual internal (mixed) treatment given to all cases of gangosa is equally efficacious in both yaws and syphilis, this compulsory treatment should cause the disappearance of gangosa.

Thirty-one cases of yaws were admitted during the year and five were treated at the native clinic.

UNITED STATES NAVAL HOSPITAL, LAS ANIMAS, COLO.

By G. H. BARBER, medical inspector, United States Navy.

The total number of all cases treated during the year was 367; of this number, 10.3 per cent had concurrent syphillis. This complication with tuberculosis adds greatly to the gravity of the prognosis, and when combined with alcoholism renders the case hopeless. The results to be expected from the modern treatment of syphilis depend largely upon the date of infection. If the disease has been in progress a number of years, with a history of intermittent periods of treatment of short duration, little is to be hoped for. There were 17 discharges with concurrent syphilis, 5 of which were "progressive, unimproved." There were 13 discharges on account of alcoholism, 9 of which were "unimproved" or "progressive." There were 25 discharges on account of being nonamenable to treatment for various reasons, chiefly alcoholism.

All of the cases complicated with syphilis, or syphilis and alcoholism, had been in the service for a considerable time and were carried as "in line of duty." It is believed that the infection with tuberculosis in these cases was due to the debilitating influences induced

by syphilis and alcoholism and in no way to be ascribed to service conditions, and therefore they should be admitted as "not in line of duty." It has been conclusively demonstrated that it is useless to hope for improvement from treatment in an alcoholic tuberculous patient who refuses to discontinue his alcohol; and it is the rule here to discharge such patients as soon as this condition is determined. Practically, all these patients arrive here with an unmistakable alcoholic history recorded in their enlistment records. It is believed that it would be good policy in the interests of economy alone to take such steps as would stop the further transfer of such cases to this hospital. They are responsible for the major portion of our troubles, due to infractions of discipline, and are a bad example for those who try so to conduct themselves as to reap every benefit offered by the institution for their welfare.

In a letter to the bureau, dated January 11, 1913, there was outlined the policy of the administration here in regard to one important feature of the treatment adopted as routine for the hospital—the Paterson graded rest and labor. This system has been elaborated to the extent found possible under conditions presented here, and, in the opinion of all the medical officers who have been stationed here during the past year and a half, it has fully justified all the expectations of those responsible for its adoption. I even hope to be able to report better results this coming year. A number of so-called new treatments have been tried out on a limited number of cases during the year, and have included tuberculin, modified tuberculin fluids, serums, intravenous injections aimed at both the tubercle toxins and the mixed toxins, and hypodermic injections, including the "phenol treatment." The results in each case were either negative, indifferent, or positively harmful. The one form of medication aimed at the disease itself, which has given promising results, has been applied to a large number of patients for the past six months and will be continued; it is that of inhalations of creosote and its internal administration.

U. S. S. NEBRASKA.

By E. H. H. OLD, passed assistant surgeon, United States Navy.

This ship was in Mexican waters from February 17 to March 31, and from November 4 to December 31, 1913, being still at Vera Cruz on the last date mentioned.

During this period a little over a month was spent off Tampico, which port is very badly infected with malaria. While there, during the month of November, this ship was at anchor about 7,000 yards offshore, and yet when there was a breeze from that direction numer-

ous mosquitoes would drift off to the ship; these, on examination, were found to be anopheles in nearly every instance. It was at first thought that they were being brought out in the launches with marketing, etc., but none could be found in same, and they could not be accounted for in that way. On account of these being present, all those men on board who had had attacks of malaria previously were immediately placed on quinine sulphate to prevent chance of an attack and thus having the mosquitoes become infected. The following order was printed and given out at quarters to every man on the ship:

In order to protect officers and men against malaria, the following precautions, recommended by the medical officer, will be observed in every particular:

1. Those who in any way come in contact with the shore, crews of boats, stewards, etc., will be sent at once to the sick bay, where they will be placed on prophylactic doses of quinine.

2. All provisions, particularly fruits, brought on board will be carefully inspected for mosquitoes.

3. The crews of launches and boats while coming off to the ship will make thorough search for mosquitoes and will kill every one found.

4. The crew is warned that malaria is transmitted only through the bite of a mosquito, and it is for the protection of everyone on board that every mosquito discovered be killed and taken to the sick bay for examination.

5. Every barrel or other receptacle containing water will be emptied and dried out at least once a week, so that mosquitoes may not use them for breeding places.

6. Should it become necessary for any member of the ship's company to sleep on shore, he will protect himself with a mosquito net, and this in addition to reporting for treatment as called for in paragraph 1 above.

Only three cases of malaria have appeared so far, and the ship has been away from Tampico for a month. In none of these three could the parasites be found, though sought for diligently, but the fever and symptoms responded to quinine; one of these three gave history of an attack several years ago and his case might have been a recrudescence.

U. S. S. NORTH DAKOTA.

By J. C. PRYOR, surgeon, United States Navy.

Sore throats: Septic sore throats have been prevalent, especially during the latter half of the year, and probably are attributable in part to the active dissemination of infectious material through the medium of dust from shellac, etc. These sore throats have varied from a punctate pharynx covered with viscid mucous exudate to severe angina. Pus organisms have been predominant, but several throats have shown the bacteriological picture of Vincent's angina, the symbiotic spirillum and fusiform bacillus being present in predominant proportion.

As the sore throats have been as prevalent at sea, where fresh milk was not available, it seems that milk may not be the cause of perpetuation of the infection, even if the original cases were caused by ingestion of infected milk.

The mouthpieces of the scuttle butts are flamed each morning with a gasoline torch, and as these are of the bubbling-spring type it is believed that danger from this source is slight.

The two most probable sources of infection are believed to be: (*a*) Mess gear; (*b*) sputum dried on shellac, which rises as dust.

Mess gear is not immersed in boiling water sufficiently long during the process of washing to sterilize it. When it is remembered that in eating food is transferred from plate to mouth and saliva is transferred from mouth to plate as each mouthful is taken, the danger of spread of infectious disease through the medium of infected mess gear is at once apparent.

Mess gear should be actually immersed in boiling water for at least five minutes.

Sputum: The improper disposal of sputum undoubtedly aids in the spread of diseases and pus infections, boils, etc. I believe the working of the present method of sputum disposal is far from the possible attainment in this direction. The galvanized-iron cuspidors now in use have a diameter of about 10 inches at the top, 9 inches at the bottom, and an inside depth of 5½ inches. These cuspidors partially filled with water are placed at convenient points in the living spaces. (It has been recommended and ordered that these receptacles be boiled daily. It is doubtful if the order is being carried out.) These cuspidors are easily moved about, their contents being slopped over as they are stumbled against by a careless skylarker, sweeper, or cleaner. Further, too frequently the cuspidor is spat at rather than into.

At a recent inspection on Saturday morning 13 out of 14 spit kids showed evidence of either fresh or dried sputum upon the outside or upon the deck in the immediate vicinage. (It must be admitted that in some cases the sputum lay not as it fell on deck, but was smeared out into a comet shape by a watchful swab during captain's inspection.) The exception (counted for loyalty to fact) was placed behind some mess tables where conveniently it could not be spat at. As cuspidors of the type now furnished are mobile they merely multiply foci of deck infection, the particles of inspissated sputum floating about in the ever dust-laden air of compartments which are the sites of such varied activities and the domiciles of so many who may be susceptible to infection.

Since expectoration aboard ship is recognized by supplying cuspidors, it seems desirable properly to provide for disposal of sputum.

For santiary reasons and because of offense to our esthetic sense we provide at convenient places on board ship, self-flushing urinals for disposal of urine in a prompt and sanitary manner.

No such provision is made for removal of sputum despite the fact that it is potentially a far greater cause of disease than urine.

Viscid, dangerous sputum is expectorated at long range toward a small, more or less mobile cuspidor, whilst the less dangerous urine is voided into a flushing urinal, offering a larger target at shorter range and with better facilities for aiming.

Perhaps it is Utopian to hope for flushing cuspidors properly located aboard ship at this time, but I believe that it is feasible and desirable to place upon brackets on the bulkheads removable cuspidors 15 inches in diameter and 8 inches deep; the mouths of the cuspidors to be 40 inches above the deck.

The cuspidors should be provided with steel straps which could be made a part of the suspending apparatus and serve as a handle when cleaning is done, thus avoiding the danger incident upon handling the cuspidors. Such a cuspidor would possess the advantage of being 40 inches nearer the source of sputum and would necessitate approaching the cuspidor in order to use it. Further, the location on a white vertical bulkhead would render improbable the careless use or kicking over of the receptacle.

Properly constructed and located cuspidors about 40 inches high are desiderata, and should be provided as are urinals to-day.

During the last three quarters of the year there have been a total of 22 cases of mumps; several of these were of the submaxillary variety.

NAVY YARD, OLONGAPO, P. I.

By J. S. Woodward, passed assistant surgeon, United States Navy.

The disease incidence is not a true measure of the morbidity or the health damage rate at this station. It can not be doubted that even in the absence of acute infections, prolonged residence results in mental and physical deterioration, such as is not seen in temperate climates. This is even more marked in enlisted men than in officers and is a fact which has been remarked upon and written about for many years. A man upon arrival in the Tropics enjoys several months, sometimes a year, shorter in some, longer in others, in which there is a feeling of well being and exhilaration, and energy and initiative are above normal. This sense of well-being lasts for a variable period, then a gradual decline takes place with general loss of tone, in some causing resort to alcoholic stimulants, in others a loss of moral stability resulting in, first, free and uncontrolled sexual relations with the native women, causing loss of self respect, laxity,

and carelessness to personal and social obligations. The time of a white man's beginning to turn native is written in unmistakable letters. The latter stages are short and can be cited in brief: Venereal infection, the hospital; or a native marriage, paid off on the station, a squawman; or last, home, and a destitute family of half-breeds. This applies to numerous incidents among the enlisted personnel. It is believed that a yearly change of station and duty would be beneficial to both officers and men. The sense of unrest and depression felt by both men and women, incident to a long rainy season, is something that can only be appreciated by going through one.

U. S. S. SAN FRANCISCO.

By T. W. REED, passed assistant surgeon, United States Navy.

Malaria: There has been one case of malaria on board during the past year, contracted on the small-arm range at Guantanamo. I might add that it was a very profound infection and demonstrated the futility of using ordinary sulphate of quinine. The patient was completely cinchonized with quinine sulphate with no improvement whatsoever. Three or four intramuscular injections of the chlorhydrosulphate produced the desired improvement in very short order.

Venereal diseases: There was less venereal disease on board during 1913 than during the preceding year. Venereal prophylaxis was in operation and the men persistently instructed in its use. As is well known, a large percentage of venereal disease is confined to the incorrigibles on the ship and the chronic liberty breakers, who contract disease after overstaying their liberty, paying no heed at all to prevention. Particular attention has been given to the application of the prophylactic within six hours, at most, after exposure. All syphilitic cases have been treated on board ship with excellent results. Intramuscular injections of the salicylate and succinimid of mercury have been used, the preparations being about equally effective in controlling the disease.

Skin diseases: The personal cleanliness of the enlisted force has improved to such a degree since an abundant supply of fresh water is issued that diseases of this class are rare. The ship's barber has received instructions in detecting these diseases and sends all suspicious cases immediately to the medical officer, thereby checking the spread of disease contracted through the general shaving mug, which is persistently used.

U. S. S. SARATOGA.

By H. R. HERMESCH, assistant surgeon, United States Navy.

During the late summer several cases of amebic dysentery developed, both while at Shanghai and while up the Yangtze River. The most striking feature of these cases was the remarkable way in which the disease yielded to subcutaneous injections of emetine. During the prevalence of amebic dysentery no uncooked vegetables were allowed on board.

In October of the past year the ship went to Chefoo for about two weeks. The climate was cool and invigorating. While there the marine detachment was sent over to camp on Kentucky Island. It was remarkable how fast several venereal cases cleared up while living this out-of-door life in tents. In December the ship went into dry dock at Olongapo, and in order to prevent lead poisoning the men chipping and applying red lead, particularly those working in the double bottoms and bunkers, were instructed regarding the usual precautions to take in order to prevent the ingestion of lead, and in addition each man was given 15 grains of potassium iodide daily. No cases of lead poisoning occurred.

U. S. S. SCORPION.

By E. P. HUFF, passed assistant surgeon, United States Navy.

The sanitary condition of all ports visited, with the exception of Constantinople, Turkey, was good as far as could be ascertained. The annual docking was done in Odessa, Russia, from June 4 to June 19. While there three anchorages were tried before a satisfactory position could be found, the water in the vicinity of several of the docks being much contaminated by sewage. The summer months were spent at Therapia, Turkey, on the Bosphorus, where the sanitary conditions were good. During the summer and fall a quarantine camp was maintained by the Turkish Army on the shore of the Bosphorus opposite Therapia, and many deaths occurred there. Rumors of there being cholera at the above-mentioned camp were current, but permission to visit the camp in order to verify the report could not be obtained.

The sanitary condition of Constantinople has improved somewhat since the war, but epidemic diseases have flourished, and are still present. Typhoid fever is very prevalent, and in the cases of cholera averaged about 10 per day during the fall, becoming much reduced in number as the cold weather approached. A partial restriction of men on liberty has recently been maintained, men being required to return to the ship at midnight, unless sleeping at the club.

Venereal diseases are still a problem on this ship that is far from a satisfactory solution. In spite of the great prevalence ashore and the utter lack of sanitary supervision, the number of cases among the ship's company has been small, and the severity mild; but considering the faithfulness with which the men have taken the prophylactic treatment supplied, the results are anything but gratifying. An effort has been made in each case exposed to ascertain the length of time before treatment is taken, and the conviction has been forced upon us that as usually employed, some 8 to 15 hours after exposure, the treatment prescribed is of practically no benefit, and is a source of danger, in that it gives the men a false sense of security. Hence we most heartily indorse the recommendation of the Surgeon General that some preparation which can be used immediately after exposure be supplied the men. During the past three months an experiment has been made with such a preparation, and some 300 have so far been employed without a single failure. Both by personal talks and private urging, the men have been encouraged to purchase these tubes, the relative advantage of the two systems having been explained to them. The cost to the men (5 cents each) has been a negligible item, and aside from the added effectiveness, the small size of the package and the absence of publicity in using the treatment on board ship has been a most appealing argument. So effective has been this method of treatment that a recommendation has been made that all men, unless specifically excused, be required to carry treatment with them when going ashore on liberty. A choice will be given them of either the ordinary penile syringe partially filled with calomel ointment, furnished free, or the specially prepared smaller package referred to above, and costing them 5 cents each. A similar method is in vogue in the British and a few other stationaires at this place, and, I am told, with gratifying results.

U. S. S. WEST VIRGINIA.

By O. J. MINK, passed assistant surgeon, United States Navy.

But one case of primary syphilis has developed among the crew of the *West Virginia* since January 1, 1912. Prophylaxis is entirely voluntary, and men are not reported for failure to take treatment. The percentage of epididymitis to gonorrhea indicates that some venereal disease is being concealed, but less than in previous years. A prophylactic tube containing enough for three treatments has recently been placed on sale at the barber shop, and seems to be increasing in popularity. It is not protected by patents in any manner.

The complement fixation test (Emery) for syphilis has been performed on all men whose records show a specific history. This technique is perhaps too delicate. It is also believed that the content of complement in human serum is often too small and too uncertain to give the best results. However, if one is willing to repeat the test in doubtful cases, much valuable information can be gained. The great advantage of the test is that it can be performed aboard ship, and adds much interest to the diagnosis and treatment of syphilis. The complement fixation test for gonorrhea (Emery) has been performed in many cases. Due to the fact that the reaction persists after a cure, its value is doubtful. However, in cases of swollen testicle with negative history it often clears up the question of line of duty and produces a prompt confession.

For some reason chancroid seems to be disappearing. The few cases seen were either trivial lacerations or proved later to be true chancres. It would seem that a keener understanding of the differential diagnosis between herpes and chancroid would do much to revise our statistics on this subject.

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TRUMAN H. NEWBERRY,
Acting Secretary.

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PREFACE.

The publication and issue of a quarterly bulletin by the Bureau of Medicine and Surgery contemplates the timely distribution of such information as is deemed of value to the medical officers and the Hospital Corps in the performance of their duties and with the ultimate object that both shall continue to advance in proficiency in respect to all of their responsibilities.

It is proposed that the Naval Medical Bulletin shall embody matters relating to hygiene, tropical and preventive medicine, pathology, laboratory suggestions, chemistry and pharmacy, advanced therapeutics, surgery, Medical Department organization for battle, and all other matters of more or less professional interest and importance under the conditions peculiar to the service and pertaining to the physical welfare of the naval personnel.

It is believed that the corps as a whole should profit, to the good of the service, out of the experience and observations of the individual. There are many excellent special reports and notes beyond the scope of my annual report being sent in from stations and ships, and by communicating the information they contain (either in their entirety or in part as extracts) throughout the service not only will they be employed to some purpose as merited but all medical officers will thus be brought into closer professional intercourse and be offered a means to keep abreast of the times.

Reviews of advances in medical sciences of special professional interest to the service, as published in foreign and home journals, will be given particular attention. While certain medical officers will regularly contribute to this work, it is urged that all others cooperate by submitting such abstracts from the literature as they may at any time deem appropriate.

Information received from all sources will be used, and the bureau extends an invitation to medical officers to prepare and forward, with a view to publication, contributions on subjects relating to the profession in any of its allied branches. But it is to be understood that the bureau does not necessarily undertake to indorse all views and opinions expressed in these pages.

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SPECIAL ARTICLES.

SOME PREVAILING IDEAS REGARDING THE TREATMENT OF TUBERCULOSIS.

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Perhaps in no other disease has such a wide variety of methods and remedies been brought forward as in tuberculosis. On first consulting the index catalogue of the Surgeon General's library in this connection I was astonished, not only at their number, but also at the character of some of them. The serious nature and wide prevalence of tuberculosis have stimulated the earnest student and research worker to untiring effort in the hope that a therapeutic agent might be found that would greatly mitigate, if not in time eradicate, an infection which produces such terrible physical and economical loss; and, to the shame of mankind, it is also true that these same conditions have stimulated the unscrupulous to reap the profits always offered to their kind by serious and chronic disease. Many remedies have been advocated as greatly modifying the course of the disease, and not a few have been acclaimed as cures. Parsons (24), in discussing one of these, said that it does not take very long after the introduction of a successful treatment for that treatment to come into general use. I would modify that to read, Any successful treatment will in time come into and remain in general use, provided its cost and the technical difficulties in carrying it out are not too great; and the extent to which it becomes generally adopted by the best-informed members of the profession may be taken as a correct index of its value. It is certain that among the hundreds of treatments which have been seconded, very few remain in general use. Each in its day had its advocates, most of them undoubtedly sincere, but each, in turn, after a comparatively brief period, fell into disuse. And while no particular remedy or treatment has been, or probably ever will be, evolved that will result in the cure of all cases, certain methods and agents have long been in use in the management of this disease and are generally recognized as powerful aids to its successful treatment.

Before reviewing these aids it may be well to consider briefly the nature of the tuberculous infection and the processes and conditions

concerned in its cure, for only by a proper conception of these can we hope to reach a rational plan of treatment. The tubercle bacillus is a true parasite, and conditions necessary for its growth outside the animal body do not, so far as is known, exist in nature. Once introduced into the body, however, no organ or tissue is exempt from its attack. In most persons the bacilli find conditions unfavorable for growth, i. e., there is a certain degree of normal resistance, so that they are almost at once destroyed by the phagocytic cells or, at most, produce only a small local lesion which is soon encapsulated and healed. This normal resistance may become gradually increased by repeated exposures which are successfully overcome. This explains why the resistance of infants to tuberculosis is relatively small compared with that of adults. In individuals whose resistance is low they spread, as MacCallum puts it, "like fire in flax," and destroy the tissues with great rapidity.

The miliary tubercle may be taken as the unit of the result of the mechanism of resistance. Microscopically it is composed of a mass of concentrically arranged elongated cells with oval vesicular nuclei known as epithelioid cells. Among these, and especially in the outer border, are the smaller round cells resembling the lymphoid cells of the blood. The whole is supported by a network of fibrin filament. The well-known giant cells may or may not be present among the surrounding cells. Tubercle bacilli can be demonstrated lying among the epithelioid cells or in the protoplasm of these cells or of the giant cells. Although this anatomical picture may vary somewhat, depending upon the virulence of the bacilli and the resistance offered by the tissues, all such units have in common the tendency to undergo a type of necrosis with the formation of caseous material. MacCallum (22) states that the central spot of opacity, which indicates the beginning of ultimate necrosis and caseation, appears within two or three days after the formation of the tubercle. Whatever vessels or capillaries existed at the point where the tubercle is formed become obliterated and disappear, and no new ones are formed among the newly formed cells. This, in part, explains the necrosis that subsequently takes place, but MacCallum believes that much more important in this respect is the action of the poison produced in the tissues by the bacilli.

Once the bacilli have gained lodgment in the tissues, there begins at once a warfare between the invading parasites and their poisons on the one hand and the tissues of the host on the other. The outcome, as in other infections, depends upon many factors—the quantity and virulence of infectious material, the route of invasion, and the resistance of the infected individual. This last factor is itself one of great complexity, involving as it does all of the many

elements that enter into that specific resistance to infection termed immunity. It is not necessary for the purpose of this paper to enter into a discussion of the mechanism of immunity. It is sufficient to bear in mind that immunity in tuberculosis, according to present conceptions, is both an antitoxic immunity and a bactericidal immunity; i. e., in response to the action of the tubercle bacilli in the tissues, substances are produced which have a destructive action on the bacilli themselves, and also substances are produced which neutralize the toxins elaborated by the bacilli during their growth in the tissues. The phagocytic action of certain cells undoubtedly contributes to the destruction of the bacilli. Baldwin (1) considers the best conception of the mechanism of immunity against tuberculosis to be a heightened digestive power of the body cells for tubercle bacilli, i. e., tuberculin reactivity.

Autopsy statistics from many sources indicate that the large majority of individuals who reach adult life have had a tuberculous infection. As only a comparatively small number of these develop symptoms that are recognizable during life, we must reach the conclusion that these tuberculous infections which are not recognizable during life undergo what may be called spontaneous cure. The bacilli are walled off and perhaps destroyed before they have been able to produce any considerable destruction of tissue and before they have liberated sufficient poisons to produce general intoxication. If, however, the bacilli gain the ascendency, even temporarily, clinical tuberculosis results. The liberated poisons diminish the functional capacity of the entire nutritive apparatus and of the organism as a whole, so that the tissues are rendered less able to combat the cause of their destruction. If to this lessened functional capacity of the cells there is added complete destruction of considerable areas, and in many cases an infection by other bacteria as well, the whole process becomes vastly more complex. The struggle is nearly always prolonged, each of the warring elements alternately gaining the advantage. The ultimate result consequently often depends upon the efficiency of the cell nutrition throughout the body to bear severe repeated attacks without permanent harm.

Treatment is directed to the production and maintenance of a high state of nutrition of the body cells by every means possible, in order that the cells may be able to produce substances which destroy or inhibit the growth of the bacilli and neutralize their toxins; in some cases to artificially stimulate the cells to the production of specific antibodies; and to the management of such special symptoms and conditions as may appear during the course of the disease. All important preventive measures do not come within the scope of this review. It is intended to consider briefly only a small number of measures employed to combat active disease. Many of these overlap,

and all may be said to be interdependent, but for our purpose they will be taken up more or less separately.

CLIMATE, FRESH AIR, AND SUNLIGHT: These are factors which can best be considered together. It is difficult to judge the value of statistics bearing upon the effect of any particular factor in the production of tuberculosis or in its cure, because other factors must be taken into account from which the particular one can not be separated. But it is now generally recognized, even by the laity, that overcrowding and living in dark, damp, poorly ventilated quarters favor the spread of tuberculosis and greatly lessen the chances of recovery. Knopf (18) quotes from a letter from Robert de Forest, former tenement house commissioner of New York City:

> More than 300,000 persons sleep every night in dark, unventilated interior rooms in tenement houses in this city. These rooms have no windows even to adjoining rooms. This state of affairs is largely responsible for the fact that 10,000 persons die of tuberculosis in New York each year.

Knopf states that bone, skin, and joint tuberculosis are especially common among children of the sunless tenement houses of large cities, and comparatively rare among children of the country who are largely in the open air and sunshine. Brewer (9), in an analysis of the returns of the Census Bureau from 10 States for the 10 years ending in 1909, shows that the mortality from pulmonary tuberculosis in the cities ranges from 15 to 50 per cent higher than in the rural districts of the same States. Lilian Brandt (7), who has analyzed the statistics of tuberculosis for the Charity Organization of New York City, says:

> All those occupations with a noticeably high mortality from consumption belong primarily to the cities and large towns, while among those with a consumption death rate below the average of 2.4 per 1,000 are found almost all that are carried on in small towns or the country.

Brown (10) quotes Johnston for the statement that mortality from pulmonary tuberculosis has long been so high in prisons and reformatories that sentence for a term of years is almost equivalent to a sentence of death by consumption. These sufficiently indicate the attention that is being directed to the importance of proper housing. Regarding the relation of tuberculosis to service conditions in the Navy, Brown (11) says:

> The confined quarters, almost of necessity overcrowded and ill ventilated, even of the battleships of to-day, render the men more susceptible. The greatest care should be exercised in the preliminary examinations, especially before long cruises, and about sputum disposal. The smaller craft, plying along the coast, should be carefully inspected and placarded, and notification of pulmonary tuberculosis should be insisted upon, in order to carry out disinfection.

As a member of boards of medical survey in cases of tuberculosis, when the diagnosis was assured, I have always cast my vote for the

recommendation "unfit for the service." No matter how complete a cure may appear, it seems to me unfair to the infected individual and to his shipmates to return him to the same or similar conditions under which the infection appeared.

Hinsdale (15), in a recent monograph, has given the results of an exhaustive study on "Atmospheric air in relation to tuberculosis." Some of his conclusions are given. The best air is that which is most free from injurious gases, dust particles, and bacteria. With these should be combined low humidity and a moderately cool temperature. The first qualifications are best filled on the coast, in or adjacent to large forests, or in the mountains, for such regions are generally sparsely populated. The old idea about equability of temperature is not of importance, except that in old people and those who are feeble great variability is a disadvantage. There is no foundation for the belief that forest regions are especially beneficial because of the presence of a greater amount of ozone in the air. Neither is there any proof for the claims of the makers of ozone apparatus that this substance is capable of benefiting persons infected with tuberculosis or other infectious diseases. Ozone in concentration far below that necessary to kill ordinary pathogenic germs is too irritating to be borne by the respiratory passages. Sea air seems to have a well-founded reputation as a powerful aid in the treatment of nonpulmonary tuberculosis in children. Hinsdale quotes Brannon for the statement that of 60,000 such cases treated in France 59 per cent were cured and 25 per cent greatly improved. Similar good results are being obtained at the Sea Breeze Hospital for Tuberculous Children on Long Island, N. Y.

The value of comparatively dry air in most cases of pulmonary tuberculosis is generally recognized and is well shown by the results obtained at the many sanatoria in the semiarid regions of the Southwest. Sandwith (30), during his 15 years residence in Egypt, met with only one case of tuberculosis among Europeans which had been contracted there, and after diligent inquiry he failed to hear of a single case among the Bedouins of the desert. The freedom from respiratory infections among arctic explorers has been frequently commented upon. Sohon (32), who as medical officer accompanied Commander Peary on his arctic expeditions in 1896 and again in 1902, stated that colds and catarrhal conditions were unknown. He believed that the fiords of Greenland offer in the summer months excellent advantages for tuberculous individuals. The bracing climate brings a prodigious appetite, especially for fats and meats, and the ability to assimilate food.

Regarding the altitude best suited to the tuberculous, there is considerable difference of opinion. Knight (17) considers elevations

between 4,000 and 6,500 feet as high altitude. As the result of long experience, he limits the age of those resorting to high altitudes to 50 years because of the inelasticity of the chest wall beyond that age. In temperament he prefers the phlegmatic to the nervous, but it is important to distinguish between those who show nervous irritability from disease and those who are temperamentally nervous, as the former frequently do well at high altitudes. Patients with advanced disease or with acute conditions should not go to such elevations. Experience convinces him that among the cases of early involvement of the apices without much constitutional disturbance, more recover at high elevations than elsewhere. He does not subscribe to the belief of Bowditch (8) that all cured patients should remain at high altitudes, although he insists that they must not return to the conditions under which the disease was contracted. Pottenger (27) doubts if altitude per se has any influence upon tuberculosis. High altitude causes greater activity on the part of the lungs and throws greater strain on the heart, which is already overtaxed. Only those can hope to be improved who are able to meet the extra demand made upon them by the climatic change. Pottenger believes that patients who secure arrest of disease at high altitudes should stay there. Residence there accustoms the heart and lungs to excessive work, and return to low levels is accompanied by degenerative changes in these organs.

Undoubtedly some climates are better than others in the management of tuberculosis, but few people can leave their homes and occupations to seek the more suitable places. Comparatively fresh air, however, can be obtained by the majority of individuals almost anywhere, and the home climate may aid in a cure if the patient will move from the overheated or the damp, dark, and poorly ventilated home to other quarters, perhaps in the same locality, where sun, air, and cleanliness abound.

Heliotherapy: The value of sunlight in the treatment of tuberculosis is well known and has been referred to above. Rollier (29), however, has gone further than others in the use of sunlight. At his sanatorium at Leysin, in the Alps, for the treatment of surgical tuberculosis, he exposes the whole body to the sun except where some light plaster dressing is used, and even here large fenestra are left so that the sunlight may have access to the diseased part. The patient is not at once exposed to the sunlight. He is first put to bed in a room and little by little the ventilators and glass doors are opened and the patient gradually accustomed to contact with the air. After this he begins his heliotherapy. The patient is at first clothed in linen or white flannel, according to the season. The head is covered with a white hat, and the eyes protected by smoked glasses. He

is then wheeled to an open balcony exposed to the direct rays of the sun and left there for perhaps an hour the first day, two hours the second day, etc. The whole body is not exposed at once. At first only the feet are uncovered during the exposure, then gradually the legs, thighs, groins, and abdomen, until at the end of a week the neck and head will be reached. The whole system aims at pigmentation of the skin; this is nearly always proportional to the resistance of the patient and enables him to bear the sunlight and cold to a surprising degree. Some of the pictures taken at Rollier's clinic and published by Hinsdale (15) astonish one at the results that have been obtained by this method, and at the exposure the patients undergo apparently not only without discomfort, but with keen enjoyment. One such photograph shows an open balcony with a row of beds on which children are lying in various degrees of nakedness, and snow lying on a near-by mountain peak and on the immediately surrounding grounds. Another shows children, entirely naked except for a white hat and a breechclout, going down the mountain side on snowshoes. There are some "before" and "after" treatment photographs that are truly remarkable. One of these shows a child before treatment, markedly emaciated, and with a great many open lesions of glandular and bone tuberculosis. It is stated that the lungs were also involved. The picture taken one year later shows the external lesions all healed and the child a perfect physical specimen, except for some deformity of the feet and hands resulting from destruction of tissue and scar contraction. The skin appears to be as brown as that of a Malay. This method of treatment has been taken up at the Sea Breeze Hospital, New York, with modifications necessitated by the climate. There are many places in the United States, however, where heliotherapy could be carried out very similarly to the methods of Rollier.

Diet: The importance of this part of the treatment is universally recognized. The careful selection and preparation of food, with attention to variety and the tastes of the patient, is worth the time and effort entailed. The weight of the patient is not always a correct index of his resistance, but a well-nourished cell is likely to be more resistant than a poorly nourished cell.

Milk, meat, and eggs should have a prominent place in the diet. Fats are also important. Jonathan Hutchinson believed that the eating of large amounts of fat was a preventive of tuberculosis. Opinions differ somewhat regarding the amount of food that should be taken. While under weight it would seem rational for patients to eat as much as they can digest and absorb. Brown (12) and others have found that the powers of digestion and absorption are often better than is indicated by the appetite. The stools should be examined for undigested food. Bonney (4) states that satisfactory

gains are sometimes secured from the ingestion of not over 25 calories per kilogram of body weight, and, on the other hand, failure to increase nutrition may result from the consumption of double this amount. Remarkable gains in weight may occasionally follow the ingestion of a very large number of calories daily, sometimes approaching even 100 per kilogram, but it is the opinion of Goodbody, Bardswell, and Chapman that such overfeeding, rather than increasing the powers of resistance, often exerts a highly deleterious effect. The very greatest importance attaches to a good appetite and digestion. Bonney believes that a generous mixed diet, without special reference to the relative proportion of proteids, fats, and carbohydrates, is usually sufficient.

Specific therapy: When Koch introduced tuberculin as a therapeutic agent in tuberculosis, extravagant hopes were entertained regarding its effects. After the nonrealization of those hopes this method of treatment for a time fell into almost complete disuse. But tuberculin treatment has merit; it was gradually revived and is now used by phthisiotherapists almost everywhere.

There are at least two conceptions of what tuberculin treatment may accomplish. The vaccination theory is to the effect that through stimulation of the various defensive resources of the body by injections of tuberculin there is produced a greater or less degree of specific immunity to the action of the tubercle bacillus itself. The toxin immunization theory holds that toxin tolerance or immunity to the poison of the bacillus results from treatment.

While nearly all the users of tuberculin agree regarding the beneficial results to be obtained by this treatment, they differ in the details of its application. These details include the choice of tuberculin to be used, the dosage, the reaction to be obtained, and the type of case suitable for treatment.

Trudeau (34) has no positive preference for any of the various preparations, but he uses B. F. (filtered bouillon) to which has been added one-fourth of 1 per cent carbolic, in preference to other tuberculins, because it is more easily absorbed and has not been changed by heat like Koch's old tuberculin. The B. E. is absorbed with great difficulty and has no special advantage over B. F. He believes that tuberculin should never be given to people with active disease, but that in chronic cases it does good. He never treats cases with fever, but if after putting them at rest their temperature falls to normal for some time he often begins treatment with minute doses. Regarding dosage, he is governed by the response rather than by the size of the dose. In a general way he considers that the less reaction obtained the better, always keeping just within the point of reaction.

Latham (20) states that despite the fact that there are great differences in the kinds of tuberculins used, the results with all appear

to be the same. His own experience has been mainly with T. R. and B. E. He considers T. R. especially useful in febrile cases. He sees no special virtue in bovine preparations. Whenever there is undue sensibility to any preparation it is well to try another. He selects for this treatment cases of recent origin with little constitutional disturbance, and chronic afebrile cases. Another class in which it is of great value includes the patients who, in spite of prolonged treatment along general sanatorium lines, make no real progress or cease to make progress, i. e., are "just holding their own." He thinks, however, that tuberculin has not been given sufficiently in febrile pulmonary tuberculosis, although its use in such cases is much more difficult and calls for mature experience and judgment. As regards dosage, care is required in the size of the initial dose and the subsequent increase of dose. Consideration must be given to the peculiarities of each individual case. An effective dose is one that produces a focal reaction. Avoid producing a general reaction. As the result of six years' experience, covering several hundred cases, Latham is convinced that the careful use of tuberculin, although rarely attended by dramatic effect, does give valuable results in the treatment of pulmonary tuberculosis. Many cases so treated maintain their working capacity for a longer period, and the tubercle bacilli disappear from the sputum in a larger proportion of cases.

Patrick (25) also states that the essential action of all tuberculins is apparently the same. When given to healthy persons tuberculin is relatively nontoxic, while in tuberculous individuals relatively small doses give rise to fever, malaise, and selective action on tuberculous foci in the body, together with local manifestations at the point of application. Wolff-Eisner (35) explains the reaction as follows: Tuberculin itself is non toxic, but in the body of the tuberculous it meets with a specific lysin (tuberculolysin), which has been produced by the tissues of the infected subject, and it is "lysinized;" i. e., the molecule is broken up with the formation of "tuberculotoxin," which produces the various phenomena known as tuberculin reaction.

Inman (16) believes that cases for tuberculin treatment should be selected, not from the standpoint of the stage of the disease as shown by physical examination, but with reference to temperature and specific serum reactions, which are the best guide to the degree of activity of the disease. For this purpose he suggests the following classification:

Class I: Resting febrile. Cases with fever at rest in bed.

Class II: Ambulant febrile, resting afebrile.

Class III: Ambulant afebrile.

In Class III, Inman uses tuberculin, preferably "old" tuberculin, in sufficient dosage to produce focal reactions. He puts Class II at rest and tries to convert such cases into Class III. Small doses of T. R. or B. E. may help do this. Class I includes a wide range from beginning cases to advanced cases, and these are unsuitable for tuberculin treatment.

Some authorities believe that tuberculin should not be given to home or dispensary cases. Lipsitz (21) does not share this view. He used it at the Municipal Free Clinic for Tuberculosis, St. Louis, and concluded that among the city poor tuberculin therapy is strongly indicated; that in incipient and moderately pronounced cases it has some curative value; that unpleasant symptoms of advanced cases are sometimes alleviated; and that when carefully employed tuberculin is not a dangerous instrument.

Except for the notorious example of last year tuberculin vaccine composed of live, even though attenuated, bacilli has not, so far as I am aware, been used on man. There is much experimental evidence that living bacilli when properly introduced into the body are capable of giving rise to a higher degree of immunity than will killed cultures or their products. Theobald Smith (31) as a result of experiments on cattle concluded that vaccination with attenuated bovine bacilli may be more efficacious than with human bacilli, and that such vaccination may be less dangerous to man than when human bacilli are used. Living bacilli, however attenuated, are not safe.

There is no evidence that serum containing sufficient antibodies to have protective or curative value has ever been produced. Baldwin (2), as a result of repeated vaccination against tuberculosis in cattle, produced a serum which contained specific agglutinins, precipitins, opsonins, and complement-deviating antibodies in small amounts, but a bactericidal effect was never demonstrated either in the serum or the leukocytes. Several years ago Baldwin (3) enumerated the difficulties in the way of successful serum therapy in tuberculosis. He said:

Two reasons appear to me obstacles to any successful serum therapy in tuberculosis: First, the difficulty of its reaching the seat of the poison, which is in the bacillus in the center of the caseated tubercle, and for the most part exerting its effects locally. Second, the serum injections excite antibodies against themselves when repeatedly administered even in small amounts, as will any serum alien to the animal injected.

He then added a general truth which should always be borne in mind:

While we ought to be alert for any additions to the therapy of tuberculosis it is too often forgotten that the maintenance of a high nutritive condition is

the patient is a prerequisite for their usefulness, and in the final analysis most of the benefit derived from them will depend on this factor.

AUTOINOCULATION—REST AND EXERCISE: This method of treatment in various forms has been employed at a considerable number of institutions. It is, I believe, extensively used at the Naval Hospital, Las Animas, Colo. Paterson (26) introduced graduated labor into the Brompton Hospital Sanatorium, Frimley, England, in 1905. He says that at first certain patients were given work in order to prevent them from becoming nuisances. After a time he noticed that these patients did better than those who were not assigned to work, and Wright suggested to him the scientific explanation for their improvement. Wright showed in his Harveian lecture in New York that there are three great agencies by which immunizing responses can be produced in the body: (1) By the inoculation of bacterial vaccines, (2) by artificially induced autoinoculations, (3) by spontaneous autoinoculations. Autoinoculations follow all active and passive movements which affect a focus of infection, and all vascular changes which activate the lymph stream in such a focus. Wright believed that when bacteria or their products pass from a focus of infection into the blood and lymph stream, intoxication effects and immunizing responses, similar to those which follow upon the inoculation of bacterial vaccines, must of necessity result. The logical conclusion, therefore, would be that nature cures bacterial infection by autoinoculation. This, however, should, if possible, be regulated, otherwise the body may be overwhelmed by an excess of bacterial poisons. Paterson thereafter proceeded to carry out this method of treatment with great care and under the strictest supervision. Patients are assigned various grades of labor, depending upon their physical condition and their temperature response, very much as the dose of tuberculin is regulated. Temperatures above 99° in men or 99.6° in women are contraindications to exercise. If there is irregular pyrexia in pulmonary cases, absolute rest must be enjoined. They must not be allowed to move in bed, to wash themselves, nor to go to the toilet. All possible means are used to stop cough, with morphine if necessary, which does not result in bringing up sputum. All exertion must be reduced to the absolute minimum, for when the patient is suffering from excessive autoinoculation it is necessary to stop all sources of further autoinoculation. At Frimley all grades of labor are prescribed from short walks to the use of a 5-pound pickax for six hours a day. If the patient is carefully watched, the danger from overdose is not great. A temperature above 99°, if accompanied by a headache, is considered evidence of an overdose, and the patient is put to bed until the temperature becomes normal. Improvement is shown by increase in weight and decrease in sputum.

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It also shortens the time necessary to stay in the sanatorium and puts the patient in better physical condition, thereby rendering him more fit to earn a living.

CHEMOTHERAPY: Under the leadership of Ehrlich several chemical compounds have been devised which will destroy in the living animal body several varieties of trypanosomes and spirochetes, but for some reason no compound has as yet been produced which has anything like this selective action for bacteria in the animal body. Much work has been and is still being done along this line, and there is at least the encouragement that no reason or principle has been found which would seem to render bacteria inaccessible to specific chemotherapy. The following reference indicates what is being done in this direction. De Witt (14) found that trypan red and trypan blue readily penetrate the tubercle in all stages of its development, including the avascular tubercle, whether introduced subcutaneously, intravenously, or intraperitoneally. Trypan red and trypan blue do not penetrate the tubercle bacillus well, and do not kill it *in vitro.* Neither seems to have any curative influence in experimental tuberculosis in guinea pigs. Silver trypan blue and iron trypan blue also penetrate the tubercle but have no therapeutic influence. Copper trypan blue, although soluble, does not penetrate normal or tuberculous tissues; it is probably changed into an insoluble colloid and retained at the site of injection. Mercury trypan blue is insoluble, is strongly bactericidal in its action on the tubercle bacillus, but is too toxic for therapeutic use, since the pigs died apparently from mercurial poisoning rather than from tuberculosis, the tuberculous process being generally very slight. The findings with this salt are suggestive.

ARTIFICIAL PNEUMOTHORAX: Stokes (33) observed that "in many cases where the disease (pneumothorax) becomes chronic, we may observe a singular suspension of the usual symptoms of phthisis." Rist (28) credits James Carson, of Liverpool, as the first (1819) to conceive the possibility of using pneumothorax as a therapeutic measure. Cayley (13) in 1884 employed artificial pneumothorax in the treatment of uncontrollable hemorrhage of the lung. He reasoned as follows:

> When we consider how largely the pulmonary circulation is influenced by the respiratory process, and the small amount of blood which circulates through a collapsed lung, I think such a mode of treatment affords a fair prospect of arresting otherwise uncontrollable hemorrhage.

Forlanini, in 1894, at the Eleventh International Congress of Medicine in Rome, published his first two cases of artificial pneumothorax. Little attention was given to his report. In 1898, J. B. Murphy, of Chicago, in his oration in surgery at the forty-ninth

annual meeting of the American Medical Association, apparently without knowledge of Forlanini's work, reported (23) five cases of tuberculosis treated by induced pneumothorax. He believed the good results were based on the general surgical observation that when an abscess is made to evacuate its contents and its walls collapse healing takes place. He also believed that by pressure immobilization, thus insuring rest to the lung, primary tuberculosis might be made to cicatrize. Murphy used nitrogen gas.

The procedure is now extensively used, and while considerable care is necessary in the selection of cases for this treatment, many favorable reports are now on record. Knopf (19) has recently summarized the indications and contraindications for its use. These are too long to consider here.

DRUGS: Drugs have a valuable place in the management of tuberculosis, especially as an aid in controlling troublesome symptoms, but their use is distinctly subsidiary to other measures that have been discussed. I recently saw a clinical teacher whose pupils number into the hundreds, write a prescription on the board before his class with the statement that he considered that prescription almost a specific in incipient tuberculosis. Such teaching, especially to physicians, many of whom are ever ready to fall into the easy and cut-and-dried way of treatment, is capable of resulting in much harm.

SUMMARY.

The modern treatment of tuberculosis is directed to the maintenance of the best possible state of cell nutrition by hygienic, dietetic, climatic, and other means; to the proper regulation of the amount of rest and exercise, for this seems to offer the best means of controlling the amount of autoinoculation; to the employment of specific therapy in suitable cases; and to the use of such symptomatic and special treatment as may be demanded by the individual case. As Bonney (6) has well said:

> The first great requisite for rational treatment consists not only of a careful preliminary investigation of all phases of the disease, historic, symptomatic, and physical, but also a diligent study of all factors pertaining to the patient, i. e., temperamental, financial, domestic, and social. The fullest measure of success in management is to be secured only by the wisest possible grouping of all the favorable influences pertaining to the case. This imposes an obligation for painstaking detail and necessitates a vast amount of study regarding the special requirements in each instance.

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THE TRAINING SCHOOL FOR THE HOSPITAL CORPS OF THE NAVY.

By F. E. McCullough, Surgeon, and J. B. Kaufman, Passed Assistant Surgeon, United States Navy.

When a military organization has to consider its source of personnel supply its policy must vary with its development and its necessities. That of a newly established country compromises with necessity and, for the time, recruits from the best available material. Later, when peace and prosperity render it possible, wisdom dictates that its aim should be the development of its personnel by that system which will, as nearly as human judgment can estimate. insure the best results.

In the United States Navy the extremely technical character of the numerous qualifications required of its line officers led to the establishment of the Naval Academy; the system of training enlisted men was developed for similar reasons.

It is generally recognized that where there is no exact analogue in civil life of the groups of the vocational corps of a military service, special training for each particular vocation is necessary to produce the best results, and such training must be given by the military service in question.

The foregoing applies with peculiar force to the Hospital Corps of the Navy. There is no group of individuals in the civil world, even in hospitals, called upon to perform more than a fraction of the duties required of the Hospital Corps. The pharmaceutical graduate is well qualified to respond to dispensing demands and, to a great extent, to perform the necessary laboratory work.[1] This indeed constitutes a very important part of the duties of this corps, but a glance at the index of the Handy Book for the Hospital Corps will elicit that such training has not provided the individual for the greater portion of the subjects in which members of the Hospital Corps of the Navy should be qualified.

Systematic instruction for the Hospital Corps began with the training school at the Norfolk Naval Hospital in 1901 (moved to Washington in 1903), and later a general order prescribing a systematic course of instruction was issued by the Navy Department. Both the former schools and the course of instruction ordered by the general order yielded good results, but with the expansion of vocational training in the Navy a more ambitious and comprehensive training has been adopted for the Hospital Corps.

When it was determined to establish a new training school for the Hospital Corps of the United States Navy the first question to decide upon was the location of the school. Arguments may be

[1] Lately, anatomy and physiology have been added to the curriculum of the leading schools of pharmacy in the United States.

advanced favoring on the one hand a naval hospital as the proper place, and on the other hand a naval training station. While a naval hospital has its advantages, consideration of the subject will develop many inadequacies.

The evolution of the baymen of our early Navy to the hospital apprentice and hospital steward of to-day marks the difference between the time when many of the baymen were recruited from the list of men who demonstrated their inaptitude for deck duty and the present day, when the hospital apprentice is a carefully selected individual who has indicated his probable fitness for the Hospital Corps by an educational examination and a period of observation of sufficient duration to determine his aptitude for this calling. Congress enacted legislation June 17, 1898, establishing the present Hospital Corps. This law has not been modified except by the creation of the commissioned grade—chief pharmacist—in 1912. Prior to this time the Hospital Corps had been a matter of departmental regulation only.

Medical officers of the Navy, who have had opportunity to observe the hospital corps of other naval services, agree that the Hospital Corps of the United States Navy has no superior.

The training of female and male nurses has been satisfactory in civil hospitals, but again, the duties of nurses in civil life are in no way comparable to those of the Hospital Corps of the Navy, except in hospital duties. The ultimate object of the training of this corps should be to fit its membership for their duties afloat with the fleet and ashore with expeditionary forces. We can rely upon the wounded in hospitals, during war time, being cared for by nurses from the Red Cross personnel, as provided by act of Congress April 24, 1912. But the Hospital Corps for belligerent service must be trained in an environment similar to that wherein they must serve, and this environment is not to be found in a naval hospital.

There are many reasons why this instruction should be located at a training station. This, indeed, seems to be the ideal location for the school. Here are located other schools for the instruction of the enlisted personnel of the Navy. The atmosphere of vocational training is to be found here and a spirit of emulation is likely to arise between the various schools. All of the special equipment which must needs be provided for this school is not to be found in any hitherto existing institution of the service.

The hospital apprentice recruit entering a military service from civil life must learn to adapt himself to an environment differing most radically from that to which he has been accustomed. In this respect he is in the same status as all other recruits entering the naval service. He must be taught the essentials of military life, and until he has learned to adapt himself to the radical departures

from his former condition his usefulness as a military unit will not be great.

Discipline is best acquired in an institution especially maintained for such purpose and equipped with adequate apparatus properly to instruct the recruit. The hospital apprentice should be housed with all other recruits and in quarters assimilated to life aboard ship. In no place other than a naval training station is this practicable. And finally, the mission of a training station is primarily instruction and that of a hospital the care of the sick.

The former naval hospital at Newport was located on Coasters' Harbor Island, immediately adjacent to the group of buildings of the training station. A new naval hospital (a type hospital) having recently been completed in Newport proper (about a quarter of a mile from the training station), the old hospital building became available for this school and it has been remodeled to accommodate a class of 100 students. It will accommodate twice that number by increasing the number of instructors and dividing the student body into two groups.

Two wards and six rooms have been equipped for instruction in practical pharmacy, chemistry, and microscopy. The equipment of the department of pharmacy of Columbia University has been closely followed (with modifications suited to a briefer course). The advice of Prof. George C. Deikman, professor of pharmacy of that institution, and his assistants was sought as to modern methods of pharmaceutical teaching, and as a result of this kindly advice it is believed that the equipment and instruction of the department are in every respect ideal. Every article used in the Pharmacopeia, from the crude drug to the finished pharmaceutical product, is available for the student's inspection and examination. He is taught to make every variety of preparation from the medicated water to the fluid extract. Each student is assigned a space at a laboratory table. The structure is of heavy oak, provided with shelves, drawers, and lockers, and each space is provided with a complete outfit, comprising selected medicines from the supply table in dispensing bottles, and a good equipment of pharmaceutical and chemical implements, as scales, weights, mortars and pestles, graduates, spatulas, test tubes, etc.

An elementary course in microscopical and bacteriological technique is given, not with the view of turning out finished bacteriologists, but to enable these students to be of practical assistance to the medical officers of the service in this work.

A large ward is equipped with 100 desks and settees; this is the lecture room, in which all didactic lectures are given and class recitations are heard.

Every necessary article of teaching equipment has been furnished for instruction in each of the several branches. The following subjects are embraced in the curriculum:

Anatomy and physiology: Instruction by lectures and demonstrations on the skeleton, manikin, and outlines of the human body; bones, principal arteries and veins, large muscles (with their action), and the joints; surface marking of the arteries; viscera, gross anatomy with demonstrations on the manikin and viscera of the cow and sheep. First-aid and emergency surgery: Lectures and drill on the control of hemorrhage, the resuscitation of the apparently drowned and from electric shock; the care of casualties aboard ship and with landing and expeditionary forces; transportation of the wounded and general consideration of surgical emergencies. Hygiene and sanitation: Lectures on field hygiene, hygiene of the march, hygiene of food, water, mess management, and personal hygiene. Clerical duties: Lectures on Department of the Navy, Navy Department bureaus, and personnel of the Navy; requisition and voucher forms, blank forms of the Medical Department of the Navy, such Bureau of Navigation forms as are used in naval hospitals, and practical work in compiling forms. Pharmacy: The manufacture of all pharmaceutical preparations in the laboratories by the student under the guidance of an instructor. Chemistry: A laboratory course in elementary chemistry; a course in urinalysis (qualitative and quantitative); a brief course in the detection of preservatives in foods. Materia medica and the action of drugs: Instruction by lectures and examination of all the materials used in medicines in the materia medica museum; the action of drugs by lectures and demonstrations on the lower animals. Students are instructed in the administration of anesthetics at the station dispensary. An elementry course in botany, using the growing plants on the station for field and laboratory purposes. This course will be sufficiently comprehensive to enable the student to understand the pharmacopeial description of official plants. Toxicology: Lectures on poisonous doses of medicines with their appropriate antidotes. Foods and cooking: This course will include lectures and demonstrations on the usual articles consumed as food; the elementary chemistry of foods; their economic and hygienic value; their use in health and disease. Practical demonstrations of cooking for the sick are given. Litter and stretcher drill: Litter and stretcher drill on the drill grounds in accordance with the Drill Regulations for the Hospital Corps of the United States Navy. Tent erection: The installation of the field hospital, camps and camp life, duties with expeditionary forces. Embalming and the disposition of the dead.

When the recruit first arrives at the station he is assigned to the receiving buildings, and remains isolated for 21 days. This measure

is designed to prevent the introduction of contagious disease on the station. His instruction during this period is identical with that of the apprentice seaman.

Students found to be deficient in academic subjects are divided into classes, according to their requirements and the instructors in academic subjects give academic instruction.

The hours between 9 a. m. and 4 p. m. (daily except Wednesday afternoon, Saturday afternoon, and Sunday) are devoted entirely to the subjects embraced in the curriculum of the hospital apprentice, and an appropriate amount of time devoted to each subject with reference to:

(*a*) Practical need of such subject as a member of the Hospital Corps.

(*b*) Possibility of further instruction of a subject after completing the course at this school and further transfer to hospital or ship.

In connection with (*b*) it has been demonstrated that the subjects in which nearly all members of the Hospital Corps are particularly deficient are practical pharmacy and materia medica. The reason for this is apparent. Neither a naval hospital nor a battleship is provided with even a small percentage of the equipment necessary for instruction in these subjects. In nearly every subject there is opportunity for continued instruction either at a hospital or a vessel of the Navy. A battleship is provided with a modern operating room, a dispensary, and a sick bay. The operating room and sick bay provide for further instruction in many of the duties of the Hospital Corps, but the dispensary affords relatively little opportunity for the acquisition of instruction in pharmacy, on account of the limited space available for laboratory purposes, and the necessity of having medicines as finished products and in as compact a form as practicable.

Litter and stretcher drills should form a very important part of the instruction of the school. The ample drill grounds of a training station afford a suitable place for such instruction. It is valuable vocational instruction which should be acquired at the beginning of the career of a member of the Hospital Corps. It improves discipline and military bearing, and affords a radical change from the classroom studies. After a period of this drill, the incident mental recuperation should enable the student's mind to be in a more receptive condition for didactic study.

The course in cooking and mess management of the hospitals should be a most valuable one on account of the commissary and cook schools on this station.

First aid is taught thoroughly at this school, using members of the class for hypothetical injuries. The sick of the station are used for demonstrating many of the duties required in hospitals.

From 9 a. m. to 4 p. m. of each day (except Wednesday afternoon and Saturday and Sunday) is devoted to laboratory, lecture or quiz. Wednesday afternoon is used for drawing clothing and small stores, "scrub and wash clothes," and bag inspection.

On Saturday morning general muster and inspection are held; Friday evening, Saturday afternoon, and Sunday afternoon are liberty periods. No liberty is granted at any other time. The evening hours are devoted to study and instruction in academic branches.

It is not difficult to eliminate during the course of this school those who are unfitted for the duties of the Hospital Corps, and steps are immediately taken to effect their discharge as undesirable. In cases where the fault is merely inability to grasp the subjects embraced in the curriculum and the individual is apparently competent to grasp other features of the service recommendation is made with a view to effecting a change of rating.

A continuous period of six months of this training will accomplish much for the student in actual knowledge and in fitting him for future study.

Experience has developed that one hospital steward is required for each 25 students in the capacity of demonstrator. A pharmacist is on duty each morning as instructor in pharmacy, chemistry, and clerical work. The entire time of a medical officer is required for lecturing and administrative purposes.

It is not intended that the training of the Hospital Corps will terminate with their course at this school. As far as may be practicable the graduates will be transferred at the completion of the course to naval hospitals for duty, and while in hospitals they will acquire further experience in practical nursing, the operating room, and in their duties at naval hospitals. On being transferred to sea duty they will receive the instruction directed in a general order of January 18, 1911, which comprises four periods weekly. As a result of their previous training and with the aid of the recently issued Handy Book for the Hospital Corps they should be able to profit by the instruction given by the medical officers and hospital stewards afloat. The Handy Book for the Hospital Corps, prepared in the Bureau of Medicine and Surgery, will greatly aid in systematizing and rendering uniform the instruction given the Hospital Corps. The elaboration of the answers in this book by the instructors fairly comprehends the entire field of didactic instruction intended.

It is confidently anticipated that the new Training School for the Hospital Corps of the United States Navy established by the Navy Department, supplemented by the loyal cooperation of the Medical Corps and the senior members of the Hospital Corps, will result in so high a state of efficiency that the system used in this institution

may well serve as a model for the training of the hospital corps of any naval service.

KHAKI DYE FOR WHITE UNIFORMS.

By W. E. EATON, Passed Assistant Surgeon, United States Navy.

Attention is invited to a method of extemporaneously dyeing white clothes for the landing forces. This method gives a much more satisfactory result than when the sulphate of iron method is used. The iron gives a more or less uncertain staining of a varying intensity, often much streaked and unsightly. Iron-dyed clothes are practically as visible as whites, while with the method here advocated a dark brown color is obtained nearer to but slightly darker than khaki or forestry green. The color is fast; the solutions easily prepared; the dyeing quickly and effectively carried out; and the material is cheap and found always in plenty aboard ship.

The preparations used are:

No. 1. 1–50 solution of lead acetate.

No. 2. 1–500 solution of potassium permanganate.

No. 3. Salt or fresh water, or both, each being put into half barrels or gun tubs in such large amounts as to allow the free handling of the clothing.

The garments to be dyed should be fresh, clean, free from starch, paint, or grease, and preferably some that have been worn and washed several times. They are first saturated in the lead acetate solution, thoroughly wrung out, and then placed in the permanganate solution for about a minute, during this time being ducked and squeezed out frequently. When well and entirely stained to the intensity of color desired, which should be about as brown as coconut shell, the garments are thoroughly rinsed in salt or fresh water, or both, wrung out, and hung up to dry.

Early in May, 1914, when there seemed a necessity for another landing in Vera Cruz, Surg. Brister and Hospital Steward Setter strom of the U. S. S. *Utah* experimented with this method of dyeing and obtained a most satisfactory result with the white uniforms of the entire landing force. This battalion had previously landed in blues, which were decidedly hot and uncomfortable; and these browned whites made a good and more generally uniform appearance than clothes dyed with iron sulphate.

SOME FACTS AND SOME FANCIES REGARDING THE UNITY OF YAWS AND SYPHILIS.[1]

By C. S. BUTLER, Surgeon, United States Navy.

Uncertainty of knowledge has ever marked the course of syphilis from ancient times down to the very present. At first, not set apart

[1] Read at the March, 1914, meeting of the Manila Medical Society.

from such innocent diseases as tuberculosis of the skin and leprosy, we find that ignorance of its usual venereal mode of acquisition is responsible for the very name which the disease bears to-day. It is unlikely that the attractive poem which christened "this world-old enemy of the race" would have been written had it been known that the unfortunate shepherd Syphilus was the victim of his own vicious practices.

Uncertainty of knowledge for a long time confused the disease with gonorrhea and for a longer time with chancroid. Uncertainty of etiology characterized the disease up to 1905 even though many of the lesions, by which we as physicians read the unfortunate diagnosis, teemed with the infected, and microscopically visible causative agent. Uncertainty of diagnosis is the daily experience of every physician and in spite of the epoch-making discoveries of the past 10 years we are still often left in doubt as to whether syphilis figures in the diagnosis of some particular condition or not. Uncertainty in the therapeutic effects of drugs (witness the *sterilisans magna* delusion) are as prevalent to-day as they were during that fortunate period about 1513 when the good Benedictus, all unaware of just what he did, accomplished the introduction of the mercury molecule to the *Treponema pallidum*. Since then, as someone has remarked, "the syphilitic cloud has had a quicksilver lining."

"For ways that are dark and tricks that are vain" the *Treponema pallidum* "is peculiar." A chronic and specific enemy of the human race, he has fooled the medical profession since the beginning of time, and I have not a doubt that it was after a long and tiresome days's experience in the clinic of Cos, about 420 years B. C., that the father of medicine, puzzled over some condition caused by syphilis, went home and wrote in his diary that observation in which every thoughtful observer since his time has been able to confirm him, namely, that "experience in fallacious and judgment difficult."

In extenuation of my presuming to bring in question the matter of duality of viruses as between yaws and syphilis, I will say that I myself am inclined to the side of duality, but that in seeking an explanation for many observed facts, the open mind attitude compels the admission that I am uncertain and that many facts are better explained on the basis that yaws and syphilis are but different clinical manifestations of the same disease.

If we start out with the supposition that the conditions are distinct, it is comparatively easy to write a description that would convince the average medical man. But if we try to explain facts observed upon the basis of duality we are often forced to admit that, under similar circumstances, syphilis could and very probably would act in the same way as the supposed yaws. Is there any one cir-

cumstance, symptom, or immunity finding which will certainly settle the whole matter? The answer is "No." Consider the assertion, made upon substantial grounds, that a healthy child born of a syphilitic mother is immune to syphilis. This is Profeta's immunity. We now know that these children have congenital syphilis, and yet many of them go through life and show no clinical evidence of syphilis. Some of them later show evidence that their disease was latent. The Wassermann reaction has partially oriented us on this point. The assertion is found in nearly all the textbooks on tropical medicine, that yaws is never hereditary. I have repeatedly found in children whose parents admitted or showed evidence of having had *bubas* that the Wassermann reaction was positive. Recently I have had under observation a child 5 years old with a deformed skull, a pustular eruption upon its body, an enlarged spleen, and a strongly positive Wassermann reaction. The father said the child had never had *bubas*, but that he himself had had it 11 years previously. He showed strong evidence of the truth of his assertion. This child had congenital syphilis, I am sure of that, and you say, "yes and the father had it in the acquired form." Well, he thinks he had yaws, and so we come to face the proposition that in the nonhereditary idea in yaws we may be reasoning upon false premises, just as we were for so many years in regard to Profeta's immunity. In this connection I wish to show the picture of a mother with yaw-like lesions on her body, and her 2 months' old child who looks like the original "little old man." This child had in addition a stomatitis, some eye condition undetermined, and an eroded, irritated condition of the skin around the anus.

The point I started out to make was that there is no fixed base line from which we can survey the two fields of yaws and syphilis. Those tests and reactions in immunity which we hold as nearly absolute often make default in the face of actual facts. A man has a primary lesion at 25 years of age; with or without treatment, he gets well and remains robust until 50, when he develops general paralysis. His Wassermann reaction is negative. We thought that he was well and had developed an immunity to further attacks of syphilis. Was he well? Was he immune? If so, why does he now have demonstrable treponemata in his brain?

On the island of Guam a female child is born. At 10 years of age she has yaws; at 20, after marrying, she has a child; and maybe later on both mother and child develop "gangosa" and give positive Wassermann reactions. Such a sequence could, perhaps, be explained in several ways. A reasonable way to explain it would be that yaws is often followed by tertiary lesions, and that the taint which the mother acquired in her attack of yaws, and for which she was never treated, had not only caused her "gangosa" but had

carried over in her child and had caused the "gangosa" and the positive Wassermann reaction in it.

The differences which are supposed to separate yaws and syphilis are stated a little differently by different authors. In the main, however, the following table, taken from Jeanselme and Rist, covers these differences fairly well:

Syphilis.	Yaws.
1. Disease pandemic.	1. Disease tropical.
2. Acquired by heredity and contagion.	2. Acquired only by contagion.
3. Begins by a primary pathognomonic lesion, at point of inoculation.	3. The initial lesion near the portal of entry is not constant. It does not differ from the lesions appearing later.
4. The immunity conferred by syphilis is in a sense permanent.	4. Reinoculation of yaws is possible.
5. All attempts to autoinoculation of a patient with secondary or tertiary syphilis are fruitless.	5. The autoinoculation of yaws is possible for an indeterminate period, but quite long.
6. The hard chancre and other signs of syphilis can appear upon a subject who may have yaws.	6. Yaws can develop upon a subject of syphilis.
7. The polymorphism of syphilitic manifestations.	7. The monotony of the eruption; it showing only the papilloma.
8. Syphilides, at least those of the tertiary period, destroy the skin and leave, after cure, permanent scars.	8. The frambesial lesion which is not exposed to any irritation heals without leaving a trace.
9. Syphilis is an affection of which the several lesions correspond to three periods—primary, secondary, and tertiary.	9. All the manifestations of yaws are identical whatever be their date.
10. Syphilitic eruptions involve mucous membranes.	10. Frambesial lesions do not involve mucous membranes.
11. Localizations in the viscera.	11. No localization in the viscera.
12. Syphilides are not pruriginous.	12. Yaws lesions are accompanied with lively itching.
13. Alopecia in secondary period.	13. No alopecia in the course of the disease.

Many differences formerly held to obtain have latterly had to be abandoned. Thus the idea formerly held of absence of tertiary lesions in yaws is now known to be entirely incorrect. Castellani's idea that the antigen of yaws was specific can not be longer maintained. Lipoidal substances will bind complement in the presence of both syphilitic and frambesial antibodies. Indeed the older idea of specificity of the Wassermann reaction is no longer held. Ashburn and Craig thought that the fact that they were unable to inoculate such a low order of monkey as *Cynomologus philippinensis* with syphilis, but could do so with yaws constituted a reason in favor of duality. We now know that the rabbit, a much lower order of animal than the monkey, is capable of successful inoculation with syphilis, and this but emphasizes the fact that technical failures occasionally throw us off the track and that we can not rely absolutely upon animals to tell us exactly what will happen when dealing with a strictly human disease such as syphilis. We do know that two human

cases of syphilis contracted from the same source will often run courses entirely different. One case will run a malignant course uninfluenced by treatment; the other will get well and perhaps stay well through a long life. This accounts for the old idea that yaws could not be cured by mercury and stultifies any attempt at reasoning that yaws is different from syphilis because in a few cases it has apparently taken a smaller amount of salvarsan to cure.

It is not possible in the time at my disposal to take up in detail the several supposed differences noted above. They may be considered collectively, however, under the following heads: (1) Epidemiologic and climatic, (2) pathologic, (3) symptomatic, (4) therapeutic, and (5) immunologic.

The epidemiologic facts which attract attention are: First, the limitation of yaws almost entirely to the dark skinned and dirty, and among these mostly to children; second, the strict limitation to the Tropics; and third, the fact that yaws is generally a nonvenereal disease. Regarding the first of these, we have in the annular syphilide a type of eruption which resembles the frambesial eruption in appearance, in distribution, and in the fact of a much higher incidence among the dark skinned than among white races.

The tropical races who have yaws are those among whom children wear little or no clothing; are filthy in personal habits, particularly as to eating, drinking, and bathing; are crowded together in their housing; and are wont to suffer from filth-engendered infections of all kinds, such as scabies, impetigo, and simple ulcers. In short, the conditions are those under which we could easily figure that syphilis, from being a disease usually transferred by venereal contact might come to be often transferred by flies, fingers, and common eating and drinking utensils. I have seen in the same house flies swarming over a yaws lesion teeming with treponemata, and also crowded around a simple abrasion on the person of a second child. It is common to see yaws lesions and those of scabies on the same patient, and I have seen—at Bacour—a child with yaws being carried astride the hip of a larger girl who had scabies and both having a goodly number of attentive flies. We can here picture the perfect team work brought about by personal contact and the fly and the itch mite.

The strict limitation of yaws to the Tropics constitutes, to my mind, one of the strongest indications that in it we are simply dealing with syphilis. There is no other inoculable and contagious disease requiring no intermediary host which is thus delimited. Run the whole gamut from leprosy to tetanus, and you will find that yaws stands practically alone if we grant that it differs from syphilis. This is all the more remarkable when we recall that yaws

is, at least potentially, a venereal disease. On the other hand, we do have in temperate climates where there is no possible question of the yaws virus having gained access, occasional cases of syphilis which exactly copy the yaws eruption (syphilis frambesiformis) in every gross particular, as well as in the class of people affected. Sir Jonathan Hutchinson covered this climatic discrepancy in a rather subtle, and perhaps unintentional, manner when he said that those Europeans who contracted yaws in the Tropics returned home with syphilis. Regarding the third epidemiological fact mentioned—that yaws is generally a nonvenereal disease—we learn from Dr. Daniels, who has seen much yaws in different parts of the world, that there are no facts connected with the transmission of nonvenereal syphilis in temperate climates which correspond to those for yaws, although there are plenty of filthy people everywhere. I would not like to question this statement, coming from so high an authority, but will say that I have never seen in any part of the United States such admirable conditions for the transmission of innocent syphilis as exist among the lower-class natives of the Philippines. Speaking of extragenital chancres, Osler and Churchman state that "in certain regions of Russia, where there are no physicians and where the most wretched hygienic conditions prevail, syphilis is, according to Tarnovsky, in 70 per cent of the cases transmitted by extragenital contagion. In these districts there are few, if any, prostitutes, and rural syphilis in Russia is, first and foremost, syphilis of the innocent." Yaws in the Philippines is a manifestation seen principally in the rural districts and in small barrios. Why this is so is a matter for speculation.

In studying the supposed differences in histopathology between yaws and syphilis it is necessary to keep in mind some quite elementary facts. First, that syphilitic eruptions vary to a certain extent histologically among themselves. The plasma cell invasion of the papillary layer of the skin which occurs in the roseola is slight and evanescent. It is not accompanied by proliferative changes in or around the blood vessels, by overgrowth of the papillæ, or epidermis. In the moist papule, on the other hand, we find not only a great deposit of plasma cells but also dilatation of the blood and lymph channels, perhaps periarteritis and endarteritis, overgrowth of the papillæ and of the different layers of the overlying epidermis, together with those changes in this last-named tissue, which we see in yaws. In other words, the moist papule or condyloma is histologically essentially a frambesial lesion.

Those syphilitic exanthems which become infected with extraneous organisms show, of course, histological changes, which are due to superadded infection, and sometimes this takes the direction of partial purulent liquefaction of the syphilitic exudate, resulting in

loss of tissue and scarring. At other times it takes the direction of papillary overgrowth, disappearance of the elastic tissue of the dermis, proliferative changes in the epidermis, and the formation of an annular or circinate lesion, in all respects essentially a yaws lesion, even to the fact that its raw surface exudes a fluid teeming with treponemata. Likewise the yaws lesion is not entirely the effect of the treponema, and at least a part of the frambesial histologic picture is due to superadded infection. The polynuclear collections of cells (or miliary abscesses) which occur in the epidermis, clearly point to this as a fact. Jeanselme, Unna, and, I think, most of the writers on the histology of the yaws granuloma, agree to this fact. The uncomplicated yaws lesion (if by that we mean one containing only treponemata) would seem to be a pathological impossibility. Marshall, in describing the histology of the yaws lesion, says, "The clinical appearance of yaws is so characteristic that it is surprising to find how closely the histological description agrees with the syphilide." Since the typical granuloma is almost certainly the resultant of combined pathological agencies, it seems to me a mistake to describe it as a distinct pathological entity.

Macleod gives the points which set off the lesion of yaws from that of syphilis as follows: (*a*) Cellular infiltration; plasma cells not so definitely arranged in rows or clustered around the blood vessels as in syphilis; no large multinuclear cells (chorioplaques), or true giant cells, or intracellular hyaline degeneration noted in yaws. (*b*) Fibrous stroma; rarefaction of the collagen more marked than in syphilis, but no organization or colloid degeneration found such as occurs in syphilitic gummata. (*c*) Blood vessels; no distinct proliferative changes in the vessel walls or endothelium as frequently occurs in syphilis. (*d*) Epidermis; marked proliferation and downgrowth of the epithelium, with great thickening of the horny layer (due to hyperkeratosis or parakeratosis) are characteristic features of yaws, while they are unusual in syphilis. It is hardly necessary to say that using these histological data, practically all of which are present in the condyloma or in the annular syphilide, as a criterion of the syphilitic nature of the macular syphilide would hardly lead us to the correct anatomical diagnosis. There is no reason to believe that histologically the frambesial gumma would differ in any essential particular from the syphilitic one. The giant cell, aside from being a very much overrated indicator of pathological difference or the reverse, has been described as occurring in yaws granulomata, I believe, by Glogner. As far as endarteritis is concerned, I am confident that I have seen endothelial proliferation in otherwise typical lesions of yaws. In short, it would seem to be impossible to differentiate yaws from syphilis upon histological grounds.

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In regard to symptoms, every observer of unbiased mind who has described accurately the clinical course of frambesia has described a condition the symtomatic habit of which is that of syphilis. Numa Rat's excellent description of the several stages of yaws caused Hutchinson to remark in the introduction to Rat's work that, if the disease he described were not syphilis, "it is clear that it offers a very exact parallel to it."

In reading the descriptions of the chancre in yaws and of the frambesial eruption it is evident that many ideas have been inherited as a result of what may be termed "literary inertia," or a tendency to transmit the opinions of older authors intact, regardless of whether they square with facts observed. Thus we find that the name frambesia was given to yaws in 1750 by Sauvage because to him the typical lesion resembled a raspberry in appearance. To my mind this is one of the most "slanderous insinuations" ever made regarding the innocent raspberry, but the idea has been preserved intact ever since. We have the opinion that the eruption of yaws is monotonous to look at because of this recurrence of one raspberry after another. As a clinical fact, the eruption of yaws is often about as polymorphous as is that of syphilis. Listen to Castellani when he tells about the eruption of the average ordinary case of yaws. He says:

> Though the frambetic granuloma is the characteristic eruption of the secondary stage, there are during this stage other types of eruption or frambesioides—papular, scaly, and occasionally ulcerative. An average ordinary case will present at the same time several typical frambesiform granulomata, numerous small reddish papules with the epidermis intact, other papules which have become moist and are covered by a tiny yellow crust, several furfuraceous patches here and there, and spots of increased pigmentation at the place of previous granulomata. Occasionally some granulomata break down and large irregular ulcers form, presenting in their center reddish papillomatous masses which, in our experience, do not usually heal spontaneously. At times in the later period of the secondary stage peculiar roundish or irregularly outlined whitish patches are present, especially on the back and arms, with a nutmeg-grater-like surface. On closer observation these patches are seen to consist of numerous hard, conical papules containing in their center an epidermic plug, which is easily removed, leaving a depression in the papules. Sometimes the plugs are spiny, and in this case the eruption closely resembled lichen spinulosus.

Schüffner, in 1907, in a study of 129 cases of yaws, describes a number of different types of eruption; ring-shaped and kidney-shaped efflorescences, some with impetiginous and vesicular lesions. In some there was a definite roseola, and in more than one quarter of the cases there was a peculiar macular eruption in which rounded spots, from 1 to 3 centimeters in diameter, were surrounded by minute papules, often becoming vesicular. Bone and joint pains occurred in 20 per cent of the cases and periostitis was common. He thinks from his study of yaws that "syphilis will be dissolved into a group of diseases." (Quoted by Marshall.)

A palmar or plantar psoriasis like that seen in syphilis is common. I have recently seen a woman with a frambesial lesion of the palm of the hand, plantar lesions like those in syphilis, a few moist papules under her pendulous mammary glands, and a maculopapular eruption over her back, just visible on the dark skin. (Since this was written this woman has developed typical frambesial buttons on her neck.) There was no history of any chancre, and a section of the palmar lesion was pronounced by Prof. B. C. Crowell to resemble frambesia more closely than syphilis.

A few words regarding the primary lesion and the question of autoinoculation. One of the great misfortunes to early diagnosis has been that a hard sore should ever have become the clinical index of primary syphilis. "This absence of sclerosis has been the fatal opener which has given hope of escape and a sense of security to many a victim of syphilis."

"In the early part of my life," wrote Colles, "I thought I could tell what was a chancre; but I am now convinced that a primary venereal ulcer may begin in any possible form of ulcer." It is entirely possible to mistake chancres of the skin for pustular ecthyma or tuberculous ulcerations or to confuse a secondary lesion with the mother syphilide.

Of the five or six types of chancre which may initiate syphilis, the incrusted form is that which is commonest upon the general integument. Even among people who are careful and observant many patients with syphilis reach the Wassermann diagnosis without ever knowing what was the trouble. Of 1,200 Wassermann reactions published for the Johns Hopkins Hospital recently by Major, 20 per cent were positive, and of these 24 per cent (or nearly one-fourth) gave no history of a primary sore. Among the personnel of the Navy, where there is little inclination to conceal the facts of an initial lesion, it is rather common to find men with unmistakably positive reactions and yet who have no memory of having had a primary sore. To some also a positive Wassermann reaction brings back memories "long since forgotten." About all that is characteristic of extragenital chancres is that, aside from the fact of being often indurated and difficult of diagnosis, their most constant feature is that they persist longer than simple ulcers. From the textbook descriptions and from available pictures these would seem to be about the most characteristic findings in the chancre of yaws.

In regard to the autoinoculability of frambesial virus, it is again necessary to remember that the serious exudate from the yaws lesion is of necessity a mixed virus. There would seem to be insurmountable difficulties in the way of ascertaining whether the *Treponema pertenue*, alone and unaided by other organisms, would breed a true raspberry lesion when inoculated upon the skin of a frambesial pa-

tient, and I submit that it is unscientific to formulate an opinion as to the autoinoculability of a virus which in its very nature must of necessity carry other organisms than that supposed to be specific for yaws. Some of the eruptions of syphilis are autoinoculable, and Hyde and Montgomery remark in this connection that "it is an obvious error to conclude that the exanthemata of syphilis are produced exclusively by the operation of a systemic intoxication, many of the pustular syphilodermata are the result, solely of pyogenic cocci, and the extension of the eruption may be by inoculation and autoinoculation." What makes the yaws lesion look more like the effect of extraneous organisms is that cleanliness and topical applications tend to cure them, but the systemic infection is influenced only by those drugs which cure syphilis.

As regards the supposed differences between the therapeutic effects of the specific drugs in yaws and syphilis, it is unnecessary to say more than has already been said. Given a thousand cases of syphilis, it would doubtless be possible to divide them into mercury-resistant and nonmercury-resistant cases, or into salvarsan-resistant and nonsalvarsan-resistant cases, by means of these two drugs. It would, however, be as illogical to conclude on these premises that the parasites in these several classes belonged to different species as it would that the hosts could be thus split off into other species than that of *Homo sapiens*.

As there is no further time at my disposal, I omit the discussion of the serologic differences supposed to obtain between yaws and syphilis. It may be said, however, that the findings resulting from animal inoculations are not in entire agreement and that the question of anaphylaxis, and of *umstimmung* was not taken into consideration in Charlouis's case of inoculation of a frambesial patient with syphilis. While little or nothing of value can be concluded from a single case, I wish to report a human case of syphilis in the secondary stage which I inoculated with material from a case of florid yaws. The result has been entirely negative (with the exception of an apparent allergic reaction) for a period of now 10 months. (This inoculation was made after full explanations and with the man's consent.)

Certain authors have reported what may be interpreted as the rather frequent occurrence of yaws following syphilis (or vice versa) in certain parts of the world, under natural conditions. If cases of this nature can be proved to be common, the observations being above question, the duality of the viruses will be proved, for reinfection in syphilis is rare. Up to 1904 only 160 cases of syphilitic reinfection had been published, and Robert W. Taylor in commenting upon these, said that "allowing much latitude, not 30 of the whole number are authentic instances." The experience of the naval medical men at Guam throws some light upon the assertion of fre-

quent occurrence of yaws and syphilis in the same patient. At that place, though about 90 per cent of the rural population has yaws at some time during life, no case of primary or secondary syphilis has been observed during 14 years. This record is so good that it is clear that a big mistake is being made somewhere, either in observing the facts, or else in reasoning upon them.

QUININE PROPHYLAXIS OF MALARIA.

By L. W. McGuire, Passed Assistant Surgeon, United States Navy.

The object in writing this article is an endeavor to arrive at some definite conclusion as to the value of quinine prophylaxis in malaria. There is at present marked difference in opinion among the medical officers of the service as to its value, and it seems that a definite and uniform opinion should be reached as to its use, especially in tropical expeditionary forces. During the advanced base maneuvers of the First and Second Advance Base Marine Regiments with the Atlantic Fleet in Culebra, some opportunity was afforded to get some data on this subject.

Culebra is a small island in the West Indies, its greatest length being 5 miles and its greatest breadth 3 miles. It contains a native population of about 750, the greater part of which live in two small towns, Roosevelt and Dewey; the remainder of the island being sparsely populated. The index of infection of malaria on this island from an examination of a number of children was found to be about 75 per cent.

The troops during maneuvers were stationed in detachments in various portions of the island, and all were exposed to infection during the night maneuvers. The mosquitoes varied in different localities, which would seem to account for the discrepancy in the percentage of infections of the different detachments, irrespective of density of native population.

First regiment and brigade headquarters: Number of men, 877; cases, 60; percentage of infection, 6.8.

This regiment sailed from Philadelphia, Pa., aboard the U. S. S. *Hancock*, January 3, 1914, and arrived at Culebra January 9, 1914, then disembarked, all being ashore by January 13, 1914.

This entire regiment received quinine prophylaxis with the exception of the signal squads, who did not receive it regularly. The total time ashore was 25 days.

Quinine was given in tablet or capsule form, and was administered under the supervision of the company sergeant. This was found to be the most satisfactory method. As a rule the men took their quinine faithfully, as ascertained by questioning each individual man that contracted malaria.

Net protection was used in the entire regiment, but could not be thorough at all times, as the men were in the trenches during the night attacks. Seventy-two per cent stated that they spent one or more nights in the trenches without the net, or could not use the net properly.

The Second Regiment sailed from Pensacola, Fla., aboard the U. S. S. *Prairie*, January 3, 1914, and arrived at Culebra January 10, 1914. Strength of regiment, 852 men; number of cases of malaria, 49; percentage of infection, 5.8. This regiment, with the exception of Company D, 128 men, received no quinine prophylaxis. This company received three doses, as follows: January 18, 8 grains; January 19, 6 grains; January 20, 6 grains. As this was insufficient for results, this entire regiment can be considered as not having received quinine prophylaxis.

Net protection was used when possible, but owing to their being in trenches during the night maneuvers, 76 per cent of these men are known to have been entirely without net protection for one or more nights, or were living for a time in "pup" tents with mosquito nets thrown over their bodies, which afford no protection. This is especially true of Company D, for the entire company lived for a time in "pup" tents near the trenches, where protection by net was practically impossible. A comparison of this company, 14.8 per cent infection, and the 3-inch battery of the First Regiment, 12.4 per cent infection, the detachments having the most heavy infection, shows that these detachments both occupied camps on low ground where mosquitoes were numerous. They both were in the same part of the island during the night maneuvers.

The 3-inch battery received quinine prophylaxis religiously while Company D did not, yet the percentage of infection of malaria was practically the same. See table No. 1.

TABLE 1.

	3-inch battery (161 men).	Companies C and I (242 men).	Company F (126 men).	Company E, Signal Corps (125 men).[1]	Company H (131 men).
Regiment	First	First	First	First	First.
Date of landing	Jan. 13, 1914	Jan. 13, 1914	Jan. 13, 1914	Jan. 13, 1914	Jan. 13, 1914.
Reembarked	Feb. 6, 1914	Feb. 6, 1914	Feb. 6, 1914	Feb. 6, 1914	Feb. 6, 1914.
Quinine prophylaxis.	Yes	Yes	Yes	Part of time	Yes: after Jan. 26.
Amount	8 grains[2]	10 grains twice a week.	7 grains daily for first 2 weeks, then 5 grains.	7 grains daily after first 10 days.	6 grains twice a week.
Location of camp	Low and near village of Roosevelt.	Point Vaca, high.	Point Soldado, high.	Old naval station.	Near Dewey, high.
Mosquitoes	Numerous	Few	Few	Numerous	Not abundant.
Net protection	Yes[3]	Yes[3]	Yes[3]	Yes[3]	Yes.[3]
Per cent of infection.	12.4	3.3	2.3	11.2	2.2.

Type of malaria (percentage), estivo-autumnal, 25; tertian, 75.

[1] Signal company was scattered at times over various parts of the island.
[2] Eight grains for 10 days, then 6 grains, skipping 2 days separately each week.
[3] Except when exposed during night maneuvers.

TABLE 2.

	Main camp (602 men).	Company A (122 men).	Company D (128 men).
Regiment	Second	Second	Second.
Date of landing	Jan. 11, 1914	Jan. 11, 1914	Jan. 11, 1914.
Reembarked	Feb. 6, 1914	Feb. 6, 1914	Feb. 6, 1914.
Quinine prophylaxis	None	None	None.
Per cent of infection	4.3	3.2	14.8.
Location of camp	Near Dewey, elevated.	High, on small island, Culebrita.	Low, Mangrove Harbor.
Mosquitoes	Not numerous	Not numerous	Numerous.
Net protection	Yes [1]	Yes [1]	Yes.[1]

Type of malaria (percentage), estivo-autumnal, 48.8; tertian, 51.2.

[1] Except when exposed during night maneuvers.

THE ADVANTAGES OF QUININE PROPHYLAXIS: The attacks of malaria of the First Regiment were delayed, the cases not developing to any extent until the 4th of February, and continued to develop until the middle of March; while the Second Regiment cases developed on the 30th of January and the last case to appear was on the 17th of February.

DISADVANTAGES: First, the symptoms were often atypical. Second, the parasites in periphal circulation often could not be found at all or only with great difficulty, thus destroying our exact method of diagnosis. Third, the giving of the quinine consumed considerable time and trouble and at times caused a feeling of discomfort in those taking it. Fourth, in addition to the 60 cases of malaria in the First Regiment, in which the parasite was found in the blood, there were nine patients who had a high irregular fever which responded promptly to quinine and which was undoubtedly malaria. The parasites could not be found on repeated examination. Of the 60 cases in which they were found, 10 were positive only when a relapse occurred, the parasite not being present during the original paroxysm, probably due to the quinine prophylaxis. Fifth, it did not prevent malaria.

RESPONSE TO TREATMENT: Little difference was noted in the two regiments, except that relapses in the men who received quinine prophylaxis were common, while there was not a single relapse in the Second Regiment. This may be partially explained by the more vigorous treatment the latter received. Tolerance to the drug was apparently not established during the three weeks in which they took it. Tolerance to quinine has been noted by various observers when taken for a long period, which would seem to be a distinct disadvantage. Surg. Bell, United States Navy, states that on making observations along this line in the Canal Zone in 1910, he found that men who were receiving the drug, in comparison with those who did not, under the same conditions, furnished fewer cases in proportion of 3 to 4; were more refractory to treatment as a rule; had a

prolonged convalescence and also furnished the greater number of relapses, which he attributed to the tolerance or affinity for quinine on the part of the body cells, and to the possible resistance of the parasite to the quinine during the time it was in the circulation of the cinchonized men in insufficient strength to kill the parasite. "Surg. Stitt, United States Navy, states he believes malarial parasites may and often do develop a resistance to quinine."

In a further discussion of quinine prophylaxis he cites an instance of a battalion of marines leaving Philadelphia, Pa., May 21, 1906, disembarking at Colon June 4, being stationed at Camp Elliott and later at Camp Reed, and reembarking on July 6, after a service of practically one month. Nine grains of quinine were given daily, and mosquito nets and head nets for men on sentinel duty were used, and yet practically this entire battalion came down with malaria after reembarking, quinine prophylaxis having been discontinued. He sums up the discussion as follows: With quinine prophylaxis there is a posibility of producing immunity to quinine on the part of the parasites which have been introduced by an infected mosquito and held in check by prophylatic but not curative doses.

Later on, when the quinine prophylaxis is discontinued, the parasite begins to multiply vigorously and seems to possess an immunity to quinine.

Surg. D. N. Carpenter, United States Navy, cites an instance of a regiment of marines sent to the Canal Zone in the fall of 1903; one battalion was located at Empire and another at Bas Obispo. The first week in January, 1904, a second regiment joined these battalions and was similarly divided. During January a few scattered cases of malaria occurred during an extensive epidemic of dengue, there being a few cases in each camp. The latter part of February all but one detachment of 500 men were sent to Guantanamo. Beginning on the transport and continuing after their arrival at Guantanamo an extensive outbreak of malaria appeared, finally necessitating their removal north. Quinine prophylaxis, grains 5, had been given at both camps when established.

The following is the opinion of several authors on works of tropical medicine and malaria. It can be seen that they are practically unanimous in their opinion as to the value of quinine prophylaxis.

Castellani and Chalmers quote Celli's figures as follows:

Method of prophylaxis:	Per cent of infection.
None	33
Quinine alone	20
Antimosquito protection	2.5
Quinine and mosquito protection	1.75

Deadrick gives numerous statistics of reduction of malaria in Italy in direct proportion to the use of quinine prophylaxis as often

from 80.1 per cent to 6 per cent. In one instance with both screening and quinine from 6.8 per cent to 0.2 per cent, .5 gm. euquinine given daily.

Thayer states that small doses, taken continuously, are efficacious, 6 grains given every other day.

Ziemann's method is to give 1 gm. every fourth day. If not well borne, reduce the dose or give euquinine.

Manson states the whole evidence is distinctly in favor of a systematic and daily employment of quinine as a prophylactic, 3 to 5 grains daily.

Daniels and Wilkinson advise its use.

Koch's method is to give 1 gm. every sixth and seventh, eighth and ninth, or ninth and tenth day, according to the severity of the infection.

Osler advises giving 10 grains of quinine daily.

The Italian Society for the Study of Malaria gives the following figures for screening alone:

802 persons, incompletely protected, 10.9 per cent.
5,163 persons, more or less completely protected, 3.3 per cent.
4,363 persons, completely protected, 1.9 per cent.
Unprotected persons, 40 per cent to 60 per cent.

The transmission of malaria through the egg into succeeding generations of mosquitoes would seem to be a possibility, although this has never been definitely proven.

Schaudinn states he has observed the infection of the mosquito egg, and believes that it is transmitted to a new generation of mosquitoes. It is known that the sporozoites enter the blood of the mosquitoes and are carried all over the body, including the ovary.

Company D, Second Regiment, was situated in an isolated portion of the island, with only four native families living in a radius of 1 mile. Considering the short life of a mosquito—one month—it does not seem probable that each one of the infected mosquitoes had recently bitten an infected native.

CONCLUSIONS.

1. Quinine in doses of from 5 to 8 grains daily will not prevent malaria, although it may retard or delay the symptoms.

2. Persons infected with malaria while taking quinine prophylaxis may not show any evidence of the disease while taking the quinine, but when it is discontinued will come down with acute malaria paroxysms.

3. After taking quinine for a long period a certain tolerance for the drug may be established, causing more difficulty in permanently curing these cases.

4. Quinine prophylaxis often masks malaria, the symptoms being atypical, and often banishes the parasite from the peripheral circulation, rendering the exact diagnosis very difficult.

5. It is belived that the eradication or great reduction of malaria in districts which were formerly infected was due to the treatment of the disease already present, combined with improved sanitary conditions, which destroy the mosquitoes and larvæ, rather than to preventing infection by so-called prophylactic doses of quinine.

6. To prevent malaria the ideal method is to eradicate the mosquitoes, if possible, or to prevent the mosquitoes from biting by net protection, combined with the treatment of persons already infected. thus eliminating the source of infection.

7. Quinine prophylaxis as a routine is not advised, but for an expeditionary force during a short, active campaign in a malarial country it is believed that malaria paroxysms can be held in abeyance temporarily in a certain proportion of the men by giving quinine, 5 to 10 grains daily.

I am indebted to the medical officers of the First and Second Advance Base Regiments in the preparation of this article, especially to the brigade surgeon, Surg. D. N. Carpenter, United States Navy. as it was through their combined efforts that the above data were obtained.

Passed Asst. Surg. H. L. Smith, medical officer of the U. S. S. *Des Moines*, had the following experience with quinine prophylaxis:

The *Des Moines* was stationed at Tampico, Mexico, from February 16 to April 21, 1914; number of crew, 300 men. During this time the ship was properly screened and quinine prophylaxis was not used. Mosquitoes were numerous. Four cases of malaria developed. The *Des Moines* was again stationed at Tampico from May 14 to May 25. Screening was only partially carried out, due to the ship being cleared for action. While there quinine was given, 5 grains daily to every man, with a double dose on Sunday.

Mosquitoes were exceedingly numerous. Ninety cases of malaria developed when the ship left Tampico, the first case on the 29th of May. The quinine prophylaxis was an absolute failure.

THE NERVOUS SYSTEM AND NAVAL WARFARE.[1]

Translated by T. W. RICHARDS, Surgeon, United States Navy.

In the history of the development of naval forces the word "dreadnaught" has, in these last years, taken on a great impor-

[1] From Arch. de Med. et Pharm. Nav., April, 1914. Translated into French by Dr. Marcandier. The original article, entitled "Gesunde Nerven und Seekrieg," appeared anonymously in the Marine-Rundschau, XXI, No. 9.

tance, stamping upon almost an entire epoch its particular motto, "fearless." The term seems so chosen that victory and superiority must attach to the name alone. Dreadnaughts, however, are nothing more than masses of iron and steel, knowing neither love, hatred, courage, nor fear. The entity which is veritably "fearless," upon which the decisive moment must always depend, is the crew—the men who handle the guns—who are stationed in the turrets or who direct the machinery. It is never ships which decide in a definitive manner the differences between peoples, but men—human brains.

The struggle for existence also plays its part in the life of peoples. It is determined by rules, and follows principles which one always finds where life is developing or should develop; that is to say, the law of the survival of the fittest. This law conserves the strongest and pitilessly permits the weakest to succumb in a manner which seems precisely most favorable for the conservation of the species without regard for the individual. That is what history has always taught, even to these latest days. Only those races which are well equipped physically and mentally have been able to survive. Victory and superiority are attributes of the people who can furnish the greatest amount of nervous force intact and who can expend the largest part of their vital energy in forging to the front and conquering the world by their genius.

In war everything is risked on one card, and it is at this moment that the stamina of the people will be measured. Inexorably, history passes over all that which is decadent, corrupt, and decrepit. In all times the health of a people will be the force which alone will be decisive in war.

The question immediately arises as to what particular importance this great fact presents for the Navy.

One is too easily inclined to think that for us, in the Navy, we have necessarily only men truly sound, who are considered fit for battle. We all know that even in times of peace we enlist only picked men, after they have been subjected to a thorough medical examination, touching their aptitude for service afloat; we know that their state of health is the object of constant solicitude, as conscientious as possible; that they do not remain aboard long unless perfectly satisfactory, from the medical standpoint, for the special exigencies of service on shipboard; and finally, that in times of peace a sick man is transferred ashore as promptly as possible. Even civilians believe that the physical and mental condition of the crews must be above reproach, so much so that extraordinary circumstances, such as long privations, insufficient care, contagious diseases, or exceptional fatigue, can not alter the general health.

But the medical officer says to himself, not without disquiet, that among these men, in appearance well set up, capable of doing their

duty and of fulfilling all their functions under ordinary conditions of peace, there is, perhaps, a great number who could and would refuse service when the moment approaches when it is necessary to face the exceptional exigencies created by a state of war and accompanied, generally, by special excitement, intense emotion, overwork, menace to life itself, or prolonged privations. It is known that there are certain forms of illness which last for years and decades, yet permit those affected to drag along their existence without doing anything remarkable and without attracting attention. It is these men, whose daily routine of life absorbs all their force, who will refuse service in time of action.

With certain individuals, the difference is enormous between the total effort that is demanded of them in time of battle and what has been considered sufficient previously; the comparison is all the more striking because, at precisely this time psychic excitation caused by patriotic enthusiasm is manifested in violent outbursts of which history has given us sufficient examples.

It is commonly said of persons who have already expended all their force for the needs of daily life that they are "nervous," they lack "sound nerves." What is the meaning of these expressions which come so readily to everyone's lips? It is not easy to give a scientific explanation which is brief and satisfactory. What, in short, does one mean by "sound nerves" (*nerfs sains*)?

We do not refer to nerves considered in the sense of conductors, sensory or motor, but imply rather those centers where all the nerves converge—that is to say, the brain and spinal cord. If their functions are not well balanced and exercised as we see them in a healthy man, then one speaks of "bad nerves" (*nerfs malades*).

In daily life a rigorous distinction is made between mental diseases and diseases of the nerves. In reality, all these affections are intimately united; they are associated, as everyone knows, with lesions of the brain and spinal cord, and, in fact, it is not easy to trace an exact limit between the two groups.

The study of nervous diseases requires on the part of the physician much general and special knowledge and creates the most difficult problems which can be presented to him, a fact which is recognized even by the layman.

We have noticed that from year to year, among the affections observed in the Navy mental and nervous diseases together, exactly those which concern us here, are becoming more and more prominent. Thanks to the more extensive experience acquired, attention is being given to the mild cases which appear insignificant and which were formerly treated with neglect until the day when it was perceived that they became aggravated, to result in general and prolonged disorders and to the great detriment of the individual and of the Navy. * * *

The medical officer who has often occasion to observe these cases will quickly discover that two great groups of affections appear with particular frequency, while many others show themselves with surprising rarity, considering so large a field. These two groups are, on the one hand, the mental disorders of young men, and on the other the nervous exhaustion (neurasthenia) of those who have served one or more enlistments.

It has been shown that these affections mainfest themselves on shipboard by breaches of discipline, that these maladies, too often unrecognized, constitute a real menace to the service, which must endeavor by all possible means to discover and eliminate them. These facts become of great importance in time of war, since mental diseases then increase rapidly in number, their morbid manifestations become more grave, and the influence exerted by those affected may be disastrous. Their plain and ignorant associates do not always estimate them at their true value, and by very reason of their affection they acquire considerable ascendancy over their comrades. The power, almost magical and irresistible, which they exercise over weak spirits is all the greater, because they expound their morbid ideas with profound conviction. * * *

Our ideas are not yet definitely fixed as to mental affections and their influence in time of war, as the theater of operations does not lend itself well to scientific observation. What we do know, is that under the influence of war the development of mental maladies is remarkably favored, and that morbid predispositions, hitherto latent, manifest themselves abruptly.

Reports based on figures from the last great wars show that the number of mental diseases is greater for all combatants, but in particular for the officers. The number of cases increases a little after the outbreak of war, reaches a maximum when the war attains its full development, and does not fall again until long after it has ended. For the Russian Army during the last war the figures rise to 2 cases per 1,000 (total of all forces). For the army in the field, one notes especially cases of excitement and mental confusion. Individuals placed in a state of lowered resistance by alcoholism, former illness, or hereditary taints were the first to be attacked. If, as we have said, an increase in the number of these cases is a fact signalizing every war, this proves that among all the men assembled many carry the seeds of an affection perhaps already recognizable by an alienist; others have had nervous trouble during their youth which will become aggravated under the influence of fatigue until manifested by symptoms which can no longer be overlooked. Mental maladies are becoming known better and better; and if the number of cases cited in reports is increasing, this increase may be accepted

with satisfaction as a sign that we understand more clearly how to search for and recognize these affections.

We must endeavor with the aid of all the resources of science to remove the dangers which menace us from this direction. The duty of the medical officer is not completely fulfilled in caring for the sick who present themselves to him. His rôle is large and more important, for with him rests the responsibility of supplying the naval service with a select group of men, sound in body and in mind. Such men are overabundant among the youth of Germany, in fit condition to bear arms.

The importance of neurasthenia seems even greater than that of the preceeding affections. * * * For many persons this term appears to be the scientific mask for a diminution in the capacity for work, and often it excites a suspicion that the individual is, in part, responsible for this state of affairs. * * *

But along with this lack of energy, which is so striking to the invalid and his associates, there exists an entire group of symptoms which can not be simulated, are unknown to the public, and to which the physician attaches great diagnostic importance. Laymen are inclined to conclude that neurasthenic troubles, easily imitable, constitute a ready pretext for those who find no satisfaction in the accomplishment of their duties or services. This point of view is absolutely false.

Neurasthenia, as a matter of fact, is a grave malady, physically and morally, accompanied by painful disturbances for the invalid, and prejudicial to his capacity for work. It is impossible to set forth here a complete clinical picture of the disease, which is well known otherwise, as the subject presents itself under too many aspects to be adequately encompassed by a few strokes of the pen. But what is particularly remarkable about the affection is the fact that it may long remain latent, with all its accompanying troubles, then suddenly light up in full force under the influence of any psychic excitation. From interesting observations and researches recently published on the alterations of nerves produced by inflammation and degeneration, it is known that nervous tissues, properly speaking, may be almost completely destroyed without ceasing to fulfill the functions which devolve upon them in the organism, while, on the other hand, an incident apparently insignificant, may suffice to destroy that which remains of the nerve substance, and so cause, immediately, total abolition of function in a nerve seemingly healthy. Can this theory be applicable to neurasthenia?

The capital event which exercises an extraordinarily detrimental influence on the nervous system is war, with all the remarkable circumstances which inevitably accompany it—great battles, long

privations, exaggerated fatigues. * * * But along with violent impressions caused by actual battle, it is necessary to take into account the perturbing influence created by prolonged nervous tension due to expectancy, inaction, and uncertainty as to the morrow. It is impossible to mention all the circumstances which may exercise analogous influences. Observations and researches concerning the influence of naval warfare on the nervous system are still very meager, and do not suffice for a clear conception from the medical point of view.

But if scientific reports are rare and incomplete, the stories of men who are strangers to medicine relate in a manner sufficiently impressive the inauspicious influence produced upon the nervous system by prolonged and distant naval operations. One who has read in the journal of Vladimir Semanoff the poignant description of the voyage of the Russian squadron from the Baltic to the Far East can form some idea of the depressing influence which is exercised upon the energy of everyone, from the admiral to the last of the crew, terminating in a profound discouragement, half equivalent to defeat, and rendering them an easy prey for an adversary already intoxicated by victories.

We are therefore obliged to fall back upon knowledge acquired in time of peace in attempting to define the influence which neurasthenia may have during a naval war. In time of peace there are always cases of this disease under treatment in our hospitals, but there surely exists a much larger number among men who pursue their daily vocations. * * * So far as capacity for work is concerned, the neurasthenic is inferior to the average among his comrades. But for the greater part of the time the situation in the Navy is such that this lack of capacity on the part of these invalids is quickly recognized, so that they are assigned to duties where their incapacity will not be prejudicial to the general efficiency. It is incontestable, however, that in time of war courage, decision, enthusiasm, clarity of view, determination, tenacity, and self-abnegation, essential and primordial qualities at this time, are completely dependent upon normal action of the nervous system.

By what means may we guarantee an unimpaired nervous system in the man selected for naval service and protect him against morbid attacks? It is only possible to answer these questions after an inquiry into the real cause of these affections.

Concerning the etiology of mental diseases the reply is brief and easy; we do not know, so there is little to say. These are, usually, congenital maladies, perhaps hereditary, bound by some natural predisposition, which develops without our being able to prevent it. Other causes have been suggested, such, for example, as certain con-

ditions incident to naval service. What is more important is early diagnosis of the affection and prompt discharge of the patient.

It is somewhat different with neurasthenia. It attacks especially continuous service men, and in the majority of cases renders them unfit for further service. Nearly always the origin of the disability is attributed to unfavorable influences within the service, the fact being recognized as such by the board charged to decide the question. The patients attribute their illness to the greatest variety of circumstances. There is not a single branch of the service (so numerous in the Navy) which has not been cited. * * * Sometimes the influence of temperature, of bad breathing, or defective nourishment is involved; sometimes laborious service in the engineering department, at the guns, on the bridge, or fatiguing mental work. In short there is no specialty which does not carry in its train some particular type of neurasthenia. All these circumstances surely play an important rôle in the genesis of this affection.

While we can not scientifically admit that these factors act as unique and exclusive causes, in the way that bacteria in the infectious diseases always reproduce a definite affection, one understands, nevertheless, that when they exert their action on a nervous system already enfeebled, they aggravate a preexisting morbid state to the point of rendering the individual unfit for further service. Heredity is of exceptional importance in the development of this malady. Everything which may ameliorate such hereditary tendencies, or eliminate unfavorable influences, demands attention. Family conditions play a rôle perhaps more important than the service. Unsatisfactory marriages, the incessant instability incident to naval life, may contribute a great deal toward rendering family life difficult. Added to these defective economic conditions, may be insufficient nourishment corresponding to a bad pecuniary situation, which is often attributed to the individual himself. Again, during the period of active construction, which has occurred in the Navy in recent years, and the enormous development which certain services have undergone, some men find themselves, by reason of these advances, in new situations where they do not measure up to their responsibilities; from this point their difficultes accumulate, leading inevitably to general premature exhaustion. These cases are sometimes met with in young petty officers who throw themselves into their career, pressed on by an ambition beyond their capacities, and who, finally, become incapable of fulfilling the ordinary demands of the service. Later we may, perhaps, be able to establish more rigorous requirements for admission, permitting easier elimination of candidates who have inaptitude.

The Navy is a new and growing arm, highly specialized, demanding much from each individual, and creating everywhere new situa-

tions. That which is required of its personnel is not demanded in ordinary life except from picked men who surpass the average. Moreover, those who fulfill these new requirements exhaust themselves more rapidly than in working under former methods and following established rules. Some day, perhaps, this situation will be ameliorated and this cause of neurasthenia lose, little by little, its importance.

Finally, alcoholism plays an undeniable rôle in the development of this malady. In recent years the use of alcohol has diminished in the Navy, and on all sides efforts are made to combat its disastrous influence. It is certain that the antialcoholic movement which is now developing should have a favorable result upon the health of the older petty officers, so far as concerns the nervous system, and consequently upon our defensive power. Its effects have begun to make themselves apparent in our day.

After having recognized the facts incriminated as causes of diseases of the nervous system, is it possible to remedy this situation? Is there a means of curing these affections, of preventing them, of mitigating their malign influence on the service, and of driving them out of the Navy? Medical science of to-day has so advanced that we can give a definite reply to these questions. When a patient consults us who is suffering from nervous exhaustion we seek at once the cause of his illness and we endeavor to suppress and remove this cause if possible. Such a patient, whose affection has been brought on or aggravated by service conditions, we must advise to give up this environment, for it is not possible materially to change unfavorable circumstances created by the service. We can foresee that after an indeterminate number of years of service, afflicted by fatigue and suffering, the ultimate effect of these unfavorable influences will be a complete nervous breakdown.

Extensive experience by medical officers with this class of cases permits opportune recognition of the gravity of the affection, appropriate treatment of benign cases, and appreciation of those which are progressive and incompatible with duty in the fleet. Opportune diagnosis of these latter cases is of supreme importance in avoiding grievous surprises upon the outbreak of hostilities.

One other question arises, Can we change any of those malign influences indicated above as causes of this malady? * * *

It is always well for the medical officer and the commanding officer to be in touch concerning such cases; it is possible, now and then, to find an isolated case where one can usefully intervene. We should not remain indifferent to the bad effects of alcohol; we should seek, on the contrary, to discover the evil and cure it. It is important to know that it is possible to combat, in a certain measure, the incon-

veniences inherent in naval service. We should separate the harmful factors which are avoidable from those which are inevitable. Concussion of the guns, vibration of the ship, motion in a seaway, heat of the Tropics, and winter tempests in the North Sea, watch duty in time of war or during maneuvers, all injurious influences from the hygienic point of view, but inevitable, are among those inherent to the career.

Other disadvantageous circumstances, such as bad or insufficient food, broken or insufficient repose, overwork, the fatigue of maneuvers, can be avoided. We are convinced that in recent years everything possible has been done to obtain the best sanitary results. All the improvements of this nature recommended by medical officers have been welcomed, investigated, and carried out.

In the considerable progress accomplished during the last 10 or 20 years in naval construction full account has been taken of hygienic requirements. As a result a transformation has been effected in conditions existing on shipboard, a transformation so radical that its effects are not slow in making themselves apparent. * * * Pains have been taken to arrange distractions for the personnel outside the service. Everywhere it is understood that one can not neglect periods of diversion between the hours of work without diminution in general efficiency. Recreation tends to conserve the equilibrium of the nervous system and promotes happiness and contentment among the crews. Clearness of view, rapid decision, self-confidence, solidarity, the consciousness of working toward a common aim, all these factors are developed by the practice of sports, and the service will thereby benefit in its turn. Let us add that the older chief petty officers are entitled to have some periods of repose and relaxation among the days of service and duty.

It must be admitted, however, that the measures taken concern particularly the men of lower ratings and not the chief petty officers and officers. For these a cessation, actual and complete, is absolutely necessary. The burdensome responsiblity which weighs on the special branches of the Navy, anxiety for preparation for battle, watch duty, so monotonous and apparently inconsequential at times, all require from officers and chief petty officers unbroken and exhausting activity. It is very desirable that some of the ameliorations effected by hygiene be applied to this situation. Nevertheless, it seems very difficult at first sight to find a radical solution for the question.

The only modification which seems consistent is to increase the number of persons so employed and by this means create more frequent periods of repose. It is not pertinent to discuss here the practicability of realizing such a reform. An undeniable effort has been made to permit alternate days of liberty and duty so as to

promote real periods of rest and relaxation during which energy may be renewed.

That which gives the Navy its greatest interest and attracts persons to the service is the situation presented where one must act single handed upon his own responsibility. Enthusiasm and the joy of accomplishing difficult and important tasks spur on the neurasthenic, who would, among feebler men, never attempt to meet the necessities of the situation.

If in time of peace we must be—and we are—on our guard against the disastrous effects of nervous disorders, equally in time of war the important and difficult duty is incumbent upon us of preventing nervous depression among the personnel and of opposing it by appropriate measures. Japanese medical officers report how life afloat is much more trying, and especially more monotonous, in war than during peace times. The service is harder, watch duty more constant—one sleeps little and eats badly. The tension is constant and sustained. Often, however, little things will help to maintain the spirits and contentment of those on board. The men were urged to sing, and whenever possible diversion was created by reading papers. The frequent receipt of presents sent by friends showed that they were remembered at home, and stimulated their patriotism. Gymnastic exercises and athletic sports were authorized and encouraged. Perhaps there are many other small ways in which the morale of the crews may be favorably influenced, and, thanks to them, the commanding officer who knows his men will get splendid results.

* * * We can now frankly ask if an apparent increase in the morbidity (from nervous disease) should breed disquietude and lead us to doubt that the Navy is fit for battle. There is reason to believe—and those who have observed the officers and men under various circumstances agree in this opinion—that there is no ground for such anxiety.

On the contrary, the demands made upon the nervous force of the naval personnel, and to which the average man responds so easily, are so great that one is astonished to see what these men are capable of doing, and the medical officer is forced to admit that the amount of nervous energy expended is enormous. But to obtain this result a kind of selection is constantly at work * * * by which the average efficiency of the complement is maintained at a standard sufficiently high for the special exigencies of the service.

What has been said above may be summarized as follows:

The primary requisite for the success of a fleet in a naval war is a healthy personnel so far as concerns the nervous system.

All possible measures should be taken in the fleet to overcome the damage caused by individuals defective in this respect, in view of

grave developments, and to assure the selection of men in the best of condition.

If it appears that, in recent years, there has been a slight increase in diseases of the nervous system this fact need not cause any anxiety regarding sanitary conditions. On an average, the crews are in condition to meet every exigency.

Medical officers must eliminate the weaklings from the Navy and see that they are replaced, as far as possible, by an equal number of sound men.

There is no peril in the present situation. Diseases of the nervous system are only a menace to an exhausted people who can not make good their deficits.

MEASLES; WITH REPORT OF CASE.

By G. F. Freeman, Surgeon, United States Navy.

The contagious diseases were long considered as disseminated by the air, but within the last two years much investigation has been carried on to show that such diseases as scarlet fever and measles are not air borne but are transmitted by contact. It is understood that by "contact" is meant not only touching the patient but the inhaling of the exhalations thrown off by patient, as in coughing, and this latter method is possible across many of the compartments on board ship. Thus in a sense the disease is somewhat "air borne," although it is really contact by the products of respiration, but not "air borne" in the sense that the disease is wafted from ship to ship by the winds that blow.

This contact can be prevented by a physical separation, as by separate stalls or cubicles, or glass compartments open at the top. Given this latter arrangement it has been found that different types of these diseases can be treated in the same ward, but there must be a more strict method of aseptic nursing.

The carrying of infection in clothing, as in some cases quoted in scarlet fever, is considered a direct contagion. It is still considered by the writer that clothing, etc., should be disinfected; blue clothing by formaldehyde gas and other clothing by soaking in antiseptic solution and washing.

While the infection of measles is not as tenacious as that of scarlet fever, and is short lived, still it has been found by Anderson and Goldberger, that the virus could be carried through six generations of monkeys, thus showing a pathogenicity of considerable permanency.

Period of contagiousness: From combined researches and experiments on monkeys it is found that the virus of measles is present in the blood serum at least 24 hours before the appearance of Koplik's

spots, and for at least 36 hours after the appearance of the eruption. In a large series of cases the Koplik's spots appear 1 day to 1½ days before the eruption. This would leave a period of about 2½ days before the eruption in which measles is contagious and a possible 1½ days after the eruption. On the other hand it is possible that the extreme of preeruptive contagiousness is as much as 7 days.

It is well established that the preeruptive stage is the most contagious, and there is a growing belief that when once the eruption is well established the disease is no longer contagious. From the fact that the virus is still virulent in the blood experimentally for at least 36 hours after the eruption, it would be well to continue to isolate cases during the first part of the eruptive stage, at least until more conclusive evidence is at hand that the disease is no longer contagious during said period.

Koplik's spots: In a series of cases (Jacobson and Baltaceame) Koplik's spots were absent in 9 per cent of cases. In 67 per cent of cases, according to Koplik himself, the spots appeared simultaneously with the eruption. In 1 per cent the spots appeared 6 days before the eruption, with a graded per cent between these, the average being 1½ days before eruption. In a few cases these spots appear without any further indications of the disease, which cases might be called doubtful, but usually are considered measles. One such case has occurred in the experience of the writer, the Koplik's spots being unmistakable, but the other symptoms did not appear. The patient, however, usually had a subnormal temperature and also a subnormal blood pressure, and at the time the eruption should have appeared the temperature became 99°, which was with him an elevated temperature.

From the above it will be seen that the Koplik's spots are pathognomonic in most cases, but in a large per cent of cases do not help in a preeruptive diagnosis. In some cases they do not appear at all and occasionally appear without any other symptoms. The preeruptive diagnosis of measles is often difficult, and a single typical Koplik spot has often afterwards been confirmed by the typical eruption.

Von Schick's conjunctival sign described as "whitish, somewhat, prominent spots on the swollen membrane of the caruncula lacrymalis, which, according to Escherick, at times are already visible before the eruption in the mouth," when found would help in diagnosis, but it seems to be of doubtful value at present until further study.

Leukopenia in preeruptive stage: From the work of several investigators there is a leukocytosis five or six days before the eruption, which is replaced by a leukopenia before the eruption appears. In the blood picture during the first part of the incubation period the lymphocytes are in the majority, and in the latter part of the period

of incubation there is a reversal of the relation between the lymphocytes and neutrophiles, there being a relative decrease in the lymphocytes; and at the time of the leukopenia the loss of the white cells is chiefly in lymphocytes which die away, but there is also a disappearance of the neutrophiles. The leukopenia is, on the average, noticeable four and a half days before the eruption, thus antedating the Koplik's spots, and in the presence of suspected cases especially would be a valuable sign. There is also an eosinopenia which appears a little later than the leukopenia. There may be at times an increase of leucocytes instead of leukopenia two or three days before the eruption.

MORTALITY: During the year 1913 there were 169 cases of measles in the United States Navy with no mortality. In civilian statistics the mortality ranges from 81 per cent in children 1 year old to 4 per cent in persons over 10 years old, the deaths generally being due to complications, broncho-pneumonia, diphtheria with broncho-pneumonia, or otitis media. A general case mortality in civilian institutions is 16 per cent. A high continued temperature, especially after four days of the eruptive period, is a symptom of some graver complication.

S—., R. E., C. P.: Reported April 30, 1914, on the U. S. S. *Nebraska* on arrival at Vera Cruz, the ship having sailed from Boston April 23. Patient was on leave at his home beginning April 13, for one week, at which time infection undoubtedly occurred.

The only symptom complained of up to the time of reporting at sick bay was loss of appetite, for which he wished some medicine. Patient had a well-marked measles rash, except on nates, hands, and feet, Koplik's spots were present; but no conjunctival spots (Von Schick). During the first day the temperature was 105.2°, pulse, 114: respiration, 34; a general bronchitis was found but no symptoms of broncho-pneumonia. The case was, of course, in the isolation ward with a hospital apprentice, the isolation ward proving its efficacy, especially as the patient became somewhat delirious, and required sedatives, bromides, etc. Urine remained normal except for the febrile reaction. Leucocyte count was 8,000. On account of the extreme temperature the patient's condition seemed serious, with a possible beginning lung involvement.

A tepid sponge bath with ice cap on head was given every four hours. In any case of measles the warm bath has been found to work most efficaciously. It is as quieting in its effects as a cold bath, and oftentimes produces wonderful results. The remaining treatment was that usually applied to measles cases; compound albolene spray to nose and Dobell's gargle to throat every two hours. Eyes were washed with boric acid and shaded to exclude bright light. Catharsis was produced daily. Abundant warm liquids and heroin

hydrochlorid cough mixture were given for severe cough. Fortunately, on the second day the patient began to improve. On the fourth day the temperature was normal. He was allowed out and about on the sixth day, and discharged to duty on the eighth day.

Men who could have been exposed to this case were examined over a period which would include the tenth to the fifteenth day of exposure. Lockers were scrubbed and clothing washed the same day. No further cases developed. Among the "suspects" were two cases with spots which were regarded as suspicious Koplik's spots, and these suspects were isolated for 24 hours, in order to prevent the dissemination of measles at the most contagious period—the preeruptive. Blood counts revealed no leukopenia, and a good laxative aided much in the disappearance of the suspected Koplik's spots. In the opinion of the writer these spots when developed are unmistakable. There is, however, a period when they are beginning in which there is some doubt.

In these cases the safe rule is to isolate the patient for observation.

CONCLUSIONS.

In addition to the usual clinical symptoms during incubation, as deviation of temperature from normal, conjunctivitis, and reddening of the buccal mucous membrane, the Koplik's spots may appear five or six days before eruption, and on the average one and one-half days before eruption. A leukopenia appears about four and one-half days before eruption, thus antedating Koplik's spots by about three days; eosinopenia about three days before eruption; lymphocyte precipitation about six days before eruption; and the reversal or displacement of blood formation (lymphocytes and neutrophils) four days before eruption.

Long periods of isolation for measles cases should not be necessary in the future, nor the isolation of such cases after they are in the eruptive stage in any other place than the isolation ward, which shuts the door on the case. The time to isolate measles cases is in the preeruptive stage and the first few days of the eruptive stage. As far as can be determined there is no necessity for isolating measles cases after the subsidence of the fever, the usual maximum duration of which is four days and minimum usually two days.

SMALLPOX AND VACCINATION.

By T. W. Raison, Passed Assistant Surgeon, United States Navy.

Probably in no other walk of life is health safeguarded to as great a degree as in the United States Army and Navy. Vaccination in

the Navy is compulsory and it is difficult to comprehend how an epidemic of smallpox, particularly of a malignant type, can occur. That this can be the case in a supposedly well vaccinated community was unfortunately proven in the recent outbreak of smallpox on the U. S. S. *Ohio.* While superficially this would appear to demonstrate the inefficiency of vaccination as a measure of protection against smallpox, on a closer examination it conclusively shows how complete a protection thorough vaccination affords.

Smallpox has been prevalent in Marseille, France, for some time, as an examination of the Public Health Reports, issued weekly by the United States Public Health Service, will show, and it was from this focus, undoubtedly, that the epidemic on the *Ohio* developed. From November 1 to November 30, 1913, 31 deaths from smallpox were reported as having occurred in Marseille.[1] It was during this period that the *Ohio* visited Marseille, and shortly after sailing from this port, while in open sea, smallpox developed on board. While in Marseille liberty and leave of absence were freely granted to the officers and men, and all availed themselves of this privilege.

Anchored in an adjoining berth in the port of Marseille was the U. S. S. *Vermont.* The same privileges of liberty and leave were granted her officers and men, and all on that ship likewise availed themselves of the privilege. The officers and crew of the U. S. S. *Vermont* had all been recently vaccinated prior to the date of arrival at Marseille; this was not the case on the U. S. S. *Ohio.* On the *Ohio* shortly after leaving the port of Marseille smallpox began to appear, the ship at that time being en route to Guantanamo Bay, Cuba. The first undoubted case of smallpox appeared December 11, and was rapidly followed by others. By December 16, when the ship arrived in Guantanamo Bay, 11 positive and 8 probable cases had developed. I use the word probable as at that time the eruption had not appeared, although the prodromal symptoms were present. The cases of smallpox, suspects, patients on the sick list, hospital corpsmen, working detail, and the writer were landed and an isolation camp established on Caracoles Point, Cuba. Three more probable cases developed on the *Ohio* the next day and three the following day; these were transferred to the camp. Upon reaching Cuba the entire crew of officers and men were vaccinated. Unfortunately, the outbreak of this epidemic occurred at sea, and no vaccine was available until arrival at Guantanamo Bay.

The *Ohio* sailed for the United States December 18, and en route to Charleston, S. C., two cases of smallpox appeared. Shortly after the arrival of the ship in Charleston she sailed for Lewes, Del.: while en route and at that place two additional cases developed.

[1] Public Health Report, Feb. 6, 1914.

This was the end of the epidemic, 29 cases in all, from which there resulted 5 deaths. On the *Vermont*, although equally exposed to the same original focus and no other precautions taken except vaccination, not a single case of smallpox developed.

While a total of 29 cases of a disease is a small number to report, in some regards this epidemic was unique. Coincident with the outbreak of smallpox on the *Ohio*, an epidemic of influenza was present and had been for several days. That this was not a mild type of smallpox without eruption is shown by the fact that some of these cases of influenza afterwards contracted typical cases of smallpox. The initial symptoms of both diseases are so similar that until the eruption appears in smallpox it is impossible always to differentiate between the two; and, indeed, it is possible that some of the cases classed as influenza may have been smallpox without eruption.

Every type of smallpox was encountered; clinically the 25 cases transferred to the isolation camp could be classified as follows: Hemorrhagic confluent type, 7; confluent type, 3; discrete type, 2; varioloid type, 13. Such a classification is only an approximation at the best, as it is impossible to draw a strict line of demarcation between the different types; one type gradually merges into another. For example, some of the cases classified as confluent had some pustules into which hemorrhage took place, and some of the discrete cases showed slight confluence on the face; some of the varioloid cases were quite severe and progressed through the various stages of the disease, while in others the eruption aborted at the vesicular stage. As in other reported epidemics, the prodromal symptoms bore but little relation to the severity of the disease; some of the cases of varioloid having very severe prodromal symptoms, although in none of the severe cases were the prodromal symptoms slight. In some of the cases classified as varioloid the symptoms were so slight throughout that, except in the presence of an epidemic, they could hardly have been diagnosed. The disease caused so little discomfort in 2 cases that the men reported for what they considered trivial complaints even in the known presence of an epidemic. One man noticing a few pustules reported for treatment thinking that he had contracted barber's itch; the other case reported for treatment thinking he had scabies. Neither of these cases had any discoverable subjective symptoms, yet both after desquamation showed typical scars. Some of the severe cases were highly delirious from the onset of the disease, and early after development of the papular stage showed subdermal hemorrhage, coalescing so as to include practically the entire body. Prodromal rashes occurred in about 25 per cent of the cases, the scarlatinal type being the most common.

It is difficult to trace the source of an infection in a city where the families of the inhabitants are more or less segregated from each

other and the points of contact correspondingly slight. Aboard a ship where each man is necessarily brought in contact with others, not once, but many times a day, the problem becomes more complex and it is almost impossible to state definitely how an infection is propagated and to rule out any other causal factor. In examining the number of men infected and their ratings some interesting suggestions as to possible means of propagation are brought out. Smallpox has been claimed to be an air-borne infection from the earliest accounts of the infection, and very strong evidence has been advanced to prove this contention. Indeed, smallpox is generally believed to be one of the best examples of an air-borne disease.

In examining the rating of the 25 cases in camp it is found that 14 of these men were from the engineer's force and 11 from the seaman branch. One of the 14 classed as belonging to the engineer's force was a barber, so that probably he should be classed with the seaman branch for purposes of comparison. The points of contact between these two branches is slight ordinarily, each branch associating only with its own members; they eat in separate messes and sleep in separate compartments, or, at least, the sleeping billets of the engineer branch are together, as are those of the deck branch. Superficially, this would indicate that the most reasonable explanation of the propagation of the infection was the air, which is common to both. Personally, I do not think that this explanation is adequate. About 11 per cent of the complement on a battleship is composed of commissioned and warrant officers and chief petty officers. No case of infection occurred in these classes, yet manifestly they had the same air supply and must have been exposed to this source of contagion many times a day. All these classes have separate messes and sleep in separate compartments from the rest of the crew, so that the only point of immediate contact is the air supply. It is true that these compartments have independent systems of ventilation, but in the routine work of the ship officers and men are brought together with the same air supply many times during the working hours. If air be the medium of contagion, it is difficult to comprehend why infection should not have taken place in these classes or why the infection should not be more frequent among those contiguous to those infected than those some distance removed.

Between the engineer and seaman branches there is one point of immediate contact that has not been mentioned and this is the scuttle butt. Here both obtain their supply of drinking water. It may be urged that with the type of sanitary scuttle butt now used in the Navy it is difficult to comprehend how an infection may be propagated, inasmuch as it is of the drinking fountain type and no cup or common receptacle is used. After several days use an examina-

tion will show that the interior of the drainage cup is lined with mouth secretion. In using the scuttle butt, upon turning the faucet a jet of water is forced from the nipple and fills the drainage cup. When the faucet is released the water in the cup escapes by a small vent hole in the bottom of the cup. Any mouth secretion floating on the water is deposited on the sides of the cup and, theoretically, this should be washed off the next time the fountain is used. Practically a small portion of this secretion floats to the surface. In the majority of instances the men, in using this fountain, do not wait for the interior of the cup to be thoroughly flushed before drinking and a large number drink directly from the side of the cup, turning the faucet only sufficiently to give a gentle flow and not drinking from the jet as they should. Another source of infection in the service undoubtedly is the passing of lighted cigarettes among chums. One man rolls a cigarette and it is not infrequent for this to be passed between three or four men.

In examining the history of this epidemic, we find that the disease was established prior to the appearance of more than the primary eruption. As soon as a case was diagnosed it was immediately isolated; in the two cases first occurring, in a compartment having a separate air supply from the rest of the ship, and one which is provided with rubber gaskets on the door to make it gas tight. These cases were admitted to the sick list 11 days after leaving port, and were in the prodromal stage of the disease. Of the several men who were in the sick bay at the time of the occurrence of the epidemic, none contracted the disease. Furthermore, the wide distribution of the disease to different ratings—among men who do not associate with each other—would indicate that this infection is not air borne, otherwise the disease would appear more frequently in contiguous berths than those widely separated. The large number of cases—29—appearing after the isolation of those infected indicates the probability of the disease being infectious prior to the appearance of the eruption.

In camp it was found impossible to isolate completely patients with actual cases of the disease from those who were not infected. In some of the tents men who did not have the disease, and never contracted it, slept side by side with cases of smallpox during its different stages. There was no case of cross infection in camp or on the ship. The only precaution taken to safeguard these men or men of the Hospital Corps was to insist on separate drinking and eating utensils and separate cleansing of those from infected cases. Vaccination was practiced as soon as possible, but this could not be effected until a week after exposure to the infection.

Sand flies and mosquitoes were a pest in the camp, and a number of biting flies were encountered. Mosquito bars offer but little pro-

tection from the first named of these, as they are so small that they readily pass through the meshes of the bar. Personally I have observed sand flies, mosquitoes, and biting flies come directly from the body of an infected case and bite me while tending patients. The same occurrence took place with the six hospital corpsmen on duty in the camp, and must have occurred with every noninfected man in camp. No case of infection occurred. Had infection taken place, it is believed that it would not have been a spontaneous malady, but the inoculated disease. This is shown admirably by Rogers in his work on infectious diseases. He states:

Inoculation of variolous virus commonly induces a benign disease. It is not difficult to compare the difference which separates the evolution of the inoculated disease from that of the spontaneous malady. In the case of inoculation the pathological agent is introduced beneath the skin into a region not favorable for its development. As a matter of fact, the spontaneous disease probably results from inoculation into the respiratory passages. The result is analagous to that observed when the virus of tuberculosis, or even glanders, is introduced beneath the skin and the infection is exhausted in local symptoms and with difficulty invades the entire economy. On the other hand, immunizing inoculation is practiced upon normal individuals who are in good health and in nowise predisposed to infection.

Undoubtedly all of the men who developed smallpox had been vaccinated at some time during their service in the Navy; but a study of the health records of these cases fails to indicate this fact in 14 instances. As soon as vaccine points could be secured everyone in camp who did not have an active case of smallpox at the time was vaccinated, and, if this attempt was unsuccessful, revaccinated. When the camp was discontinued and the men transferred to the U. S. S. *Cumberland*, each one was vaccinated, irrespective of whether he had had smallpox or previous vaccination, and the results in all classes of cases are given in the text below.

An examination of the health records of the cases of the hemorrhagic confluent type of smallpox showed that in one case vaccination had been unsuccessfully attempted in July, 1911; this is the only entry on this record under vaccination. Another case had been vaccinated three times in January and February, 1912; two of these attempts are entered as negative, the last as positive, but no scar could be found upon the body, and the man stated that all attempts were unsuccessful. In none of the other cases was any entry under vaccination made upon the health record, and in none of these seven cases of this type of the disease was a scar of a successful vaccination upon the body. Three deaths occurred in camp from this type of the disease, these being the only deaths from smallpox at that place. One death occurred on the twelfth day of the disease, one on the fifteenth day, and the third on the twenty-fourth day. In the last-mentioned case the direct cause of death was gangrene of the lower lobe of the

left lung; in the other two cases death was a result of the toxemia with its consequent exhaustion and no specific cause could be assigned. One of the patients who recovered, in the course of the disease, developed a keratoiritis. Of the four patients with the hemorrhagic type who recovered, two showed light but characteristic takes when vaccinated upon leaving camp. One of the cases in which vaccination upon leaving camp was unsuccessful had been vaccinated on the *Ohio* the day before transfer to camp; this vaccination was successful and ran a typical course uninfluenced by the disease and apparently had no effect on the course of the disease.

In the confluent type of the disease an examination of the health records of the three cases of this type showed that an unsuccessful attempt at vaccination had been made in one case in January, 1911. No entries had been made of vaccination in the other two cases. None of these cases showed a scar of a successful vaccination upon the body. Only one of these cases was successfully vaccinated on leaving camp; a light but characteristic take resulted. One case of this type of disease developed acute hemorrhagic nephritis during convalescence.

The health records in the two cases of the discrete type of smallpox show that an attempt was made to vaccinate one of these men in June, 1913. This is reported as successful, but no scar could be found on the body, and according to the man's statement it was negative. This patient was vaccinated the day prior to being sent to camp as a probable case of smallpox; this vaccination was successful and ran a typical course. In the other case no entry of vaccination was made on the health record. This case in the course of the disease, and as a sequel, developed a keratoiritis. Neither of these cases had scars of previous successful vaccinations. Vaccination on the *Cumberland* on leaving camp was unsuccessful in both cases.

From the above it will be seen that the 12 serious cases of smallpox never had had a successful vaccination, as shown by the absence of any vaccination scar on their bodies. From these 12 cases three deaths and three permanent disabilities resulted. Two of these cases who recovered without any disability were vaccinated during the prodromal stage of the disease; neither of these two had any complication resulting from the disease and both convalesced promptly, although there is insufficient evidence to state positively that vaccination modified the severity of the disease.

An examination of the health records of the 13 cases of varioloid treated in camp show, in this type of the disease, in six instances no record of vaccination in the health records; in four, attempts at vaccination were unsuccessful; in three cases the attempts are entered as positive. In two of those marked positive the men claimed that no scar resulted, and that these were negative. In

all 13 cases successful vaccination scars were found upon the body. One case in this type transferred to the camp had been vaccinated the day prior to transfer; this vaccination was successful and ran a typical, though mild, course. One of the cases, in which the result is entered in the health record as negative, the man claimed was positive, and showed two scars of successful vaccination upon his arm. The date of previous successful vaccination in these cases varied from 43 years to less than 6 months. On leaving camp these cases were vaccinated on the *Cumberland*. Ten of these gave a positive result. In the three cases giving negative results, one had been vaccinated successfully at the time of the attack, one had been successfully vaccinated less than six months prior to the attack of smallpox, and the third ran an extremely mild course, and had been reported as successfully vaccinated in October, 1912, although the man claimed that the scar of the successful vaccination was a result of vaccination in 1896, and that the attempt entered in his health record as successful was negative. Five of the 10 men giving positive results showed a markedly accelerated reaction on vaccination; the time of incubation being shortened and the general reaction very severe.

Ten cases of other diseases, having been exposed to contagion in the sick bay of the U. S. S. *Ohio*, were transferred with the smallpox cases and suspects to the camp. Six of these cases were diagnosed as influenza, and at no time showed any skin eruption. All these cases were vaccinated repeatedly in camp and upon discharge from the camp, on the *Cumberland*. Four of the influenza cases had successful vaccinations in camp, another had a successful vaccination on the *Cumberland*, while in one case many attempts were made without success. The last successful vaccination was stated by this man to have occurred about 19 years ago. One of the other four cases had a fracture of a metacarpal bone, and had been vaccinated successfully about five years ago, but had contracted varioloid at that time. Vaccination in camp was unsuccessful, but a slight but typical vaccination was made on the *Cumberland* on leaving camp. The other three cases, at time of transfer to camp, had venereal diseases; one had been successful vaccinated about 15 years ago; attempts to vaccinate in the camp and on the *Cumberland* were unsuccessful. The other two cases had been vaccinated successfully six months prior to transfer to camp, and while attempts in camp were unsuccessful, both had successful vaccinations on the *Cumberland*.

Ten men in good health, including myself, were detailed to camp. All had been successfully vaccinated at some previous time varying from 6 months to 13 years from the last successful vaccination. All

of these men were vaccinated several times in camp and on the *Cumberland*. In seven of the cases the attempts were unsuccessful.

It has been noted that in many cases of reenlistment the men are not revaccinated, and it is believed that this may open an avenue to a start of some future epidemic. This could be avoided by revaccination at the time of reenlistment. It may be urged that vaccination may in some instances prove unsuccessful after many attempts. My experience has been that in such cases three or four vaccinations made simultaneously on different parts of the body are more likely to insure success. However, it must be admitted that occasionally individuals are encountered immune to vaccination, and not quite so infrequently to revaccination.

In closing this article, I wish to take occasion to thank Surgeon Edgar Thompson, United States Navy, for his many acts of kindness and assistance, and for the vaccinations performed on the U. S. S. *Cumberland;* also the hospital corpsmen who so well performed their duty in the isolation camp.

CONCLUSIONS.

1. Thorough vaccination will probably entirely protect a community from smallpox.
2. After the outbreak of smallpox thorough vaccination will limit the epidemic and shortly stamp it out.
3. Compulsory vaccination must be carefully supervised and unsuccessful cases be revaccinated at a period of at least each six months until success is insured or the case proven immune to vaccination by three attempts.
4. Successful vaccination within six months does not necessarily protect from infection.
5. Successful vaccination confers a degree of protection which lasts through life to a greater or less extent.
6. An attack of smallpox in the unvaccinated does not confer certain immunity from vaccination.
7. Varioloid, except in cases recently vaccinated prior to the attack, probably sensitizes the person to vaccination after the attack.
8. Smallpox is probably not an air-borne infection.
9. Smallpox is probably not transmitted by bites of insects.

RABIES.

Methods of Diagnosis and Immunization.

By F. X. Koltes, Passed Assistant Surgeon, United States Navy.

At the navy yard in New Orleans, occurred recently, in a regiment of marines stationed there, five cases of threatened rabic infection in

persons who were bitten by a dog infected with the disease. The questions which arose in connection with hydrophobia as regards its diagnosis in animals, prophylaxis, and immunization have served to provide the text of a brief discussion in which it is intended to reiterate a few of the common facts regarding hydrophobia in general, and more particularly to describe one of the recent modifications of the Pasteur antirabic treatment, the one employed in the cases mentioned.

Now, hydrophobia when considered in relation merely to its numerical incidence, is a disease of comparatively little importance, in the naval service at least, yet, on account of its terrifying reputation, it ranks high in the thoughts of any community in which its presence is suspected. It is well, therefore, to keep ourselves familiar with the salient facts of rabies in general, because the necessity for dealing with them comes frequently without warning and the problems in relation thereto are usually abruptly thrust upon our attention.

In every case of accident wherein the possibility of hydrophobia infection comes into question inquiry should immediately be made as to the circumstances under which it occurred, with special reference to the behavior of the animal and to the number of persons bitten. If, for instance, it be found that several persons were bitten by the same dog within a short time, as was the case above referred to, this fact would be suspicious in itself, because one could hardly imagine an animal to have cultivated a lifelong habit of attacking people and be himself allowed to live. In other words, we may assume that its behavior has undergone a change, and this, together with voice changes in the dog, constitutes the characteristic sign of the early stages of rabies. In any case, the dog should be secured and observed, or at least observed, if privately owned, and not killed. If it had rabies in the infective stage—i. e., if the saliva was virulent at the time of accident—it will be revealed within 10 days by unmistakable signs and symptoms of dumb or furious rabies, of which paralysis of the hind legs is one symptom common to both forms and is diagnostic of the disease; but if the dog is well at the end of that time rabies need not be suspected.

It may be that the dog had been killed before the matter was brought to your attention. In that case the diagnosis may be made by the demonstration of Negri bodies in the brain tissue. Diagnosis by this method has, however, these limitations, that in the course of the disease in animals the saliva may become virulent before Negri bodies have appeared, that occasionally they are absent altogether, and that their demonstration requires not only a certain equipment for the preparation of sections, but also a judicious and discriminating eye, which is only gained from experience. Their detection, therefore, is not always easy, and to be able to pass upon

their presence or absence correctly in all cases is, in my opinion, one of the refined accomplishments of microscopic pathology.

For the purpose of examination, sections or smears may be made. It is only necessary to outline the procedure in the case of the latter, for the reason that anyone who has the necessary microtome for section cutting at hand has also probably some good work on pathological technique.

Smears are made by excising small pieces of brain tissue from regions where Negri bodies are most abundant, that is, from the cornu ammonis, the cerebellum, and from the cortex around the fissure of Rolando. These are pressed between two slides, which are drawn apart, giving you two preparations, which are then fixed by neutralized methyl alcohol for two minutes, washed in water, and stained by heating gently over a flame with the following: Dissolve 3 drops of an alcoholic solution of basic fuchsin in 10 c. c. of distilled water; add to this 2 c. c. of Löffler's methylene blue. Dry and examine. Negri bodies will appear as sharply defined bodies within the nerve cells some distance from the nucleus and readily distinguishable from it. It is unnecessary to discuss the nature of Negri bodies here—whether they are protozoa or cell inclusions, it sufficing to say that their unmistakable presence is diagnostic of rabies. (Stimson.)

There is, as a final resource, the method of inoculating an emulsion of fresh brain and cord of the suspected dog subdurally into rabbits. A positive diagnosis will be revealed by signs of paralysis of the hind legs of the inoculated animal in the average time of 15 days. From one of these methods a diagnosis will almost certainly be derived.

When the question of necessity for immunizing arises the decision should lean on the side of safety. The average inoculation period for rabies in man is 40 days, so there will be ample time in which to begin treatment while the diagnosis is being determined. If for any reason it appears inadvisable to wait 15 days or more, treatment may be instituted earlier and then stopped at any time without harm to the patient, if during the course of it, the diagnosis be found negative.

The local treatment of any wound incurred by the bite of an animal, should be the cautery and for this purpose nitric acid is generally accepted as being the only effective chemical agent. It should be applied thoroughly, enlarging the wound if necessary, in order to reach the deeper portions, exercising, of course, the proper degree of caution in the employment of so violent a caustic.

We now come to the subject of immunization, the indications for which have already been referred to in previous paragraphs. The Pasteur method of immunization is briefly as follows: The material

employed is the spinal cords of rabbits killed by fixed virus; that is, virus which by repeated injection from rabbit to rabbit has attained a constant maximum of infectivity. Such a virus will cause death, when injected subdurally, in six days. Cords are dried over caustic potash at a temperature of 23° C. whereby the virus becomes rapidly attenuated. The dose is one-half cubic centimeter of cord, emulsified in normal salt solution, and is injected subcutaneously for a period of 18 or 21 days, depending upon the nature and location of the wounds. The longer period is required for the intensive treatment, the shorter for the mild, and the following table shows the number of doses and the age of cord for every day of treatment.

TABLE 1.—*Pasteur treatment.*

Intensive treatment (calculated 3,000 M. I. D.).			Mild treatment (calculated 2,160 M. I. D.).		
Day.	Number of doses.	Age of cord, days.	Day.	Number of doses.	Age of cord, days.
1	4	14-13-12-11	1	2	14-13
2	4	10-9-8-7	2	2	12-11
3	2	6-6	3	2	10-9
4	1	5	4	2	8-7
5	1	5	5	2	6-6
6	1	4	6	1	5
7	1	3	7	1	5
8	1	4	8	1	4
9	1	3	9	1	3
10	1	5	10	1	5
11	1	5	11	1	5
12	1	4	12	1	4
13	1	4	13	1	4
14	1	3	14	1	3
15	1	3	15	1	5
16	1	5	16	1	6
17	1	4	17	1	3
18	1	3	18	1	3
19	1	5			
20	1	4			
21	1	3			

The results which were secured by this method, the discovery of which was announced over 30 years ago, when the science of immunity was yet in its dawn, has ever since been the marvel of the medical world; and if investigators have sought to modify somewhat the method of the master, it has not been out of criticism of its efficacy, but only out of a desire to simplify and thereby to facilitate its more extended use. The disadvantages in Pasteur's technique which the many modifications have tried to obviate are the following: First, the long time that is required for treatment with all the inconvenience and expense thereby entailed; second, the large amount of laboratory equipment and animal material required to carry on the treatment, which can only be supplied by regular institutes necessarily located in widely separated localities.

It has been demonstrated that fixed virus is practically noninfective for man. Investigators have therefore sought to devise

methods of cord attenuation in which the immunizing properties are not lost so rapidly as in the Pasteur method. Others have offered methods whereby gradually increased dosage is secured, not by attenuation of material, but by dilution of fresh material. All of them have as their aim the shortening of the time required for treatment, some of them securing greater antigenetic power at the same time. It will suffice here only to mention the principle involved in the methods that have been presented by the various workers, all of which, with one notable exception, being equally as safe and efficacious as the original method.

1. The use of unmodified fixed virus in increasing doses. (Ferran.)
2. The dilution of fresh fixed virus. (Höyges.)
3. Fixed virus attenuated by drying. (Pasteur.)
4. Fixed virus attenuated by heat. (Babes.)
5. Fixed virus acted on by bile. (Frantzer.)

Others still have secured attenuation by the use of artificial gastric juice, glycerin, carbolic acid, mechanical disintegration and, lastly, antirabic serum, which has been found to be capable of neutralizing fixed virus *in vitro.*

One of the more recent methods of immunization which has been introduced is that of Harris, of St. Louis, and his method, slightly modified, is employed by Couret of Charity Hospital, New Orleans, where the cases above referred to were treated.

It will be well, before beginning a description of the Harris method, for purposes of comparison, to state briefly the result of the work of Harvey and McKendrick, who in a large series of experiments have accurately measured the infectivity of rabic cord, expressed in dosage units, in the fresh state and from day to day as it is undergoing desiccation in the Pasteur method. The unit of measurement established is the M. I. D.—that is, the minimal dose by weight of fixed virus injected subdurally, which will cause paralysis in the rabbit in six days, and the figures are given in the following table:

Fresh cord equals 0.025 mg., or 1 mg. equals 40 M. I. D.
1 day cord equals 0.05 mg., or 1 mg. equals 20 M. I. D.
2 day cord equals 0.2 mg., or 1 mg. equals 5 M. I. D.
3 day cord equals 1.0 mg., or 1 mg. equals 1 M. I. D.
5 day cord equals 2.0 mg., or 1 mg. equals 0.5 M. I. D.

It will be noted that one day of desiccation reduces the infectivity about one-half, it requiring twice the amount for 1 M. I. D., each milligram containing but 20 M. I. D., where fresh virus contains 40. Two days of desiccation reduce infectivity 8 times, three days 40 times, five days 80 times, and a nine-day cord is practically noninfective. The infectivity is very rapidly lost, therefore, in this method of desiccation, nearly all of it by the fifth day. From a

computation made from the above table, in conjunction with the table of dosage in Pasteur's treatment, it can be calculated that the number of units given is about 3,000 for the intensive and 2,160 for the mild treatment.

Harris utilizes both brain and cord as material, and subjects these organs, obtained from a rabbit killed by fixed virus, to freezing by CO_2 snow or liquid air, and then to drying in a vacuum over sulphuric acid at a temperature of $-15°$ to $-18°$ C. (salt and ice). Prepared in this manner he has found, in consequence of over 200 experiments, that the infectivity of the virus is retained for a comparatively long time when at a temperature of 12° C. or less, and for purposes of comparison the following table is submitted, showing quantity in 1 M. I. D. and number of units in 1 milligram:

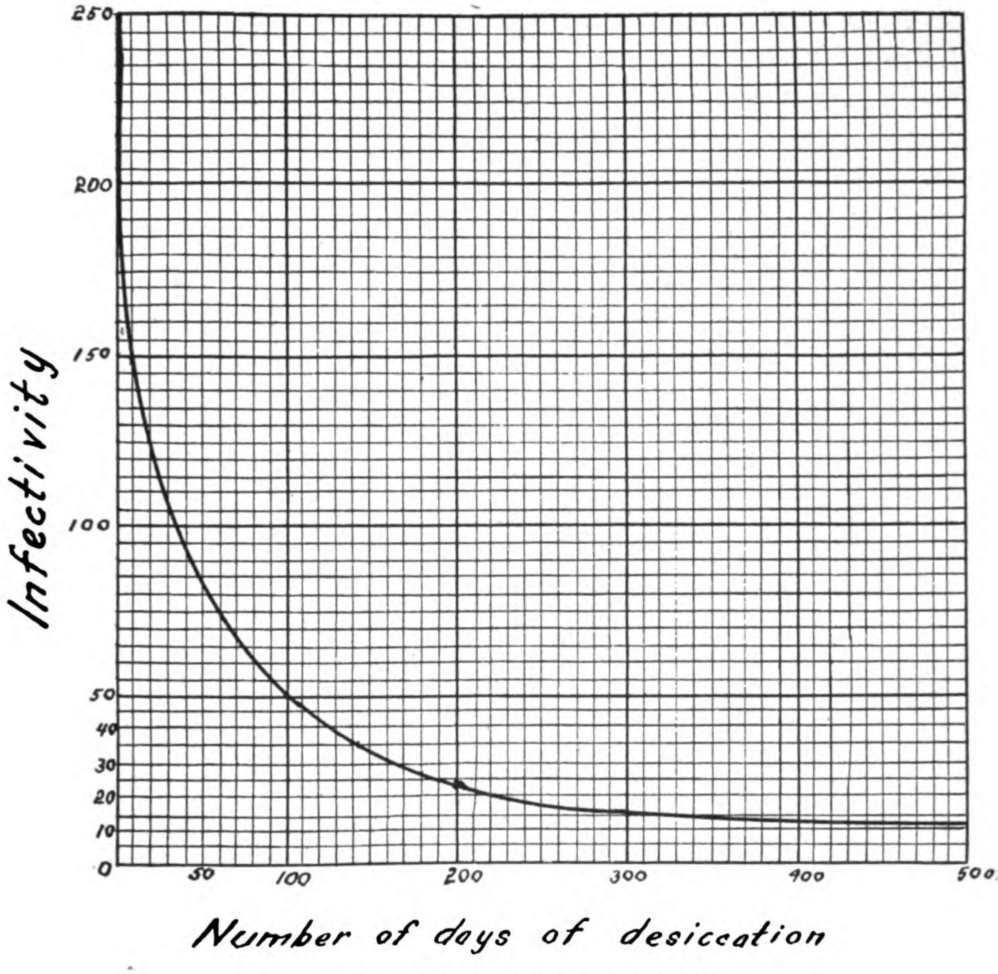
Desiccated cord (kept at ice-box temperature).	M. I. D.	Units in 1 mg.
	milligrams.	
1 to 5 days	0.004	1 mg. equals 250 M. I. D.
21 days	.008	1 mg. equals 125 M. I. D.
50 days	.01	1 mg. equals 100 M. I. D.
100 days	.02	1 mg. equals 50 M. I. D.
200 days	.05	1 mg. equals 20 M. I. D.
500 days	.10	1 mg. equals 10 M. I. D.

It should be stated that the weights given above are for completely dehydrated cord, and allowance should be made for weight of water in the Pasteur cords. The table is only designed to illustrate the high degree of stability of the infective properties, and a brief examination shows that material kept in this manner retains its infectivity a long time; a 200-day cord for example being equal to a 2-day cord of Pasteur, and a cord kept 500 days is two and a half times as infective as a 3-day Pasteur cord.

The study of a curve showing the loss of infectivity in rapid desiccation will illustrate the fact that by the two-hundredth day, while the greater part of the infective units are lost, it remains nearly constant thereafter up to 500 days. (Chart 1.) The rate of loss rapidly increases however, when preserved in higher temperatures. At room temperature, infectivity rarely lasts more than five months. On the other hand, if the material is kept at $-1°$ to $-3°$ C., it is maintained practically at its full strength as long as 75 days, during which time, if kept at 12° C., it will be remembered, three-fifths of its infectivity was lost.

In both methods there is attenuation by desiccation. The explanation for the excess of loss of infectivity in Pasteur's over Harris's method is given by Harris and Shackell, who state that:

> It is the general belief that the attenuation of a rabic cord depends primarily upon the loss of water. Our work leads us to believe that it is the method of extracting the water which results in attenuation or destruction of virulence and not the extraction of water per se. To state it differently, slow desiccation



VIRUS ATTENUATION WITH HARRIS METHOD.

attenuates and destroys the virus directly by reason of concentration of salts and other substances which are in solution in the brain and cord. The action is therefore in essence a chemical one.

It is generally supposed that Pasteur cords, after they have lost all infectivity, are but slightly capable of producing immunity; that the immunizing power of a given portion of rabies cords is a function of the unkilled remnant of rabies virus which is contained in that cord. It is well known, however, that when other methods than drying are employed to destroy infectivity of rabies virus its immunizing qualities are still retained, and this is illustrated in the method of Babes, who uses heat, and Ferran, who uses carbolic acid for attenuation. The use of killed cultures for vaccination in other diseases is furthermore analogous and illustrative of this principle.

Harris claims to have shown that desiccated virus which has lost the larger part of infectivity still possesses immunizing properties, due to what he calls the noninfective units. Thus if 1 milligram of virus possessing originally 250 M. I. D. loses three-fifths of its infectivity, it is then said to possess 100 infective and 150 noninfective units, the latter still having a high degree of antigenetic power. He has conferred adequate immunity to dogs by injecting a few doses of material several months old which contained only a small proportion of its original infectivity. The immunizing value of this portion is, however, difficult of computation, since sufficient time has not yet elapsed to render his material entirely free from infective properties. The principle is utilized by him to safeguard against possible accidental infection of rabies, giving a preliminary dose of virus which contains infective and noninfective units in the proportion of 1 to 25, which material is at least 6 months old. Couret, of New Orleans, does not consider this precaution necessary, relying on the demonstrated fact that fixed rabies virus is noninfective for man.

The method of administration of Harris material is similar to that of Höyges, whose method is based upon the dilution of virus rather than upon quantitative destruction in drying. He gives as a minimum 5,000 units during a course of six days. For more urgent cases, such as severe bites on the hand, 10,000 units are given, and for lacerated wounds of the face 30,000 units. This is 10 times greater, as measured in minimal infective doses, than the intensive treatment of Pasteur, yet it is given in 15 days instead of 21. His scheme contains the advantages possessed by those of Pasteur and Höyges, in that it combines the use of attenuated noninfective material of the former with the simplicity of the quantitative dilution of the latter.

The application of the method as employed by Couret at Charity Hospital is in its essentials similar to the original, yet a brief repe-

tition may not be out of order. The cord and brain both are utilized. A paste is made of rabic material and then put in CO_2 snow, which freezes it and permits it to be powdered. It is then placed in a box under a vacuum with sulphuric acid to dry and is kept in sealed tubes in a vacuum at ice-box temperature. One milligram of this material when fresh contains 250 units. The virus is then carefully weighed as to units, the table for attentuation being consulted, and then dissolved in normal salt solution, 2 c. c. for a dose. Injections are made subcutaneously into the flanks; 10,000 units are given for ordinary cases for a period of 11 days. For bites about the face he gives 15,000 units in 15 days. The dosages for ordinary cases are given in Table 2.

TABLE 2.—*Harris-Couret modification.*

Day.	Number of doses.	Units in doses (M. I. D.)	Total (M. I. D.)
First	2	125-125	250
Second	2	125-250	375
Third	2	250-250	500
Fourth	1	500	500
Fifth	1	750	750
Sixth	1	1,000	1,000
Seventh	1	1,200	1,200
Eighth	1	1,500	1,500
Ninth	1	1,500	1,500
Tenth	1	1,500	1,500
Eleventh	1	1,500	1,500
			10,575

It is only necessary for those under treatment to register as out patients, reporting for treatment at specified times, and neither the exactions of the routine nor the effects of the injections need necessarily interfere with the ordinary cares of life. No one of our patients, one of whom was an officer, reported any untoward symptoms throughout the 11-day course, and they were kept on the sick list only as a matter of convenience to all concerned.

Harris reports 182 cases injected with this material for the prevention of hydrophobia and has also used it on a large number of dogs either bitten by or in contact with rabid dogs. No deaths have occurred in either the patients or the animals. Couret, with a less extensive experience, has had equally good results.

For an enumeration in succinct terms of the advantages claimed for this method I will quote Harris, who says:

The advantages claimed for this method of preparation are safety, economy, and convenience. It is safe because the greater portion of the material injected is capable of immunizing without being infectious. It is economical both to the patient and to the laboratory because it requires a much shorter time, never more than 15 days, to administer a full treatment than most of the older methods. It is ofttimes a great hardship to require persons to leave home for

a period of three weeks or more, not to mention the added cost to them for board and lodging.

It is especially economical to the laboratory in time, labor, and money. Material can be prepared two or three times a year and put aside to be used only when needed; and as one rabbit furnishes enough material to immunize from 20 to 25 patients the initial cost of this is practically negligible. The work can be undertaken in any hospital or municipal laboratory without increasing the staff or the expense. To be able to prepare at one time material enough for from 6 to 12 months' use, and to have this always ready for any number of patients, is such a lessening of labor and anxiety as only those who have followed a classic method of drying cords can appreciate.

In the estimation of the value of a method of rabies immunization a consideration not to be overlooked is that of the facility of shipment and its utilization at distant points. In the method under discussion, while no mention of this feature is made by the author, it would seem that such use of his virus, by packing it in ice, can readily be carried out; and in conclusion I would add this possibility to the long list of merits of a scheme which, should a longer list of cases treated show equally good results, may be considered as being the most economical and efficient of all the Pasteur modifications so far devised.

SYPHILIS ABOARD SHIP.

With suggestions for systematic records and treatment.

By G. F. Cottle, Passed Assistant Surgeon, United States Navy.

The diagnosis of syphilis up to a few years ago used to be based on clinical signs, such as the appearance and feeling of the initial lesion, the time and appearance of the secondaries, and in the tertiary stages, the clinical findings backed by evidence gained from a therapeutic test. In 1905 Schaudinn discovered the causative agent of syphilis; in 1906 came the Wassermann reaction, and in 1912 Noguchi's luetin test. To-day one may speculate upon and discuss at length the various points in favor of calling a given initial lesion syphilitic or chancroidal, a tertiary lesion syphilitic or other, but the discussion becomes academic rather than practical. With the new methods an exact diagnosis can be made the first week after infection in a high percentage of cases by proper search for the *Treponema pallidum;* after the first week the Wassermann reaction will determine a diagnosis before the appearance of secondaries in 90 per cent of cases; applied to the cerebrospinal fluid, the Wassermann reaction may enable us to anticipate and therefore prevent the explosion of a crippling cerebral lesion or the slower onset of tabes and paresis, while the provocative Wassermann reaction and the luetin tests will give a measure of the efficiency of treatment and probably establish the fact of a cure.

Salvarsan was brought to the American market in 1909; a little later came neosalvarsan. The hope of Ehrlich that in these drugs we had a cure of syphilis in one treatment has not been realized. It is, however, held that a few weeks or months of intensive salvarsan-mercury treatment will take the syphilitic nearer a cure than would three years of the old mercury-potassium iodid treatment.

The change which these discoveries and their application to cases has brought about is revolutionary. The chapters in the textbooks on syphilis have had to be rewritten; some old cases thought cured have been studied in a new light and found to be uncured. To make a diagnosis by waiting for the appearance of secondaries is said to be inexcusable; to abort the disease in its early stages is possible; to pronounce a case cured without the proper serum and skin tests is wrong; to prevent tabes, paresis, and a host of tertiary manifestations appears to be possible.

In Bulletin No. 3, War Department, Office of the Surgeon General, June, 1913, entitled "Studies of Syphilis," there is gathered a mass of facts, statistics, and opinions of the greatest practical value. The dictum of a few years ago, "Wait for the appearance of secondaries and then treat the patient for two or three years with mercury and then potassium iodid and hope for a cure of most cases, but expect parasyphilis in a few and relapse in some," is in marked contrast to the following quotation from Studies of Syphilis: "Early diagnosis. by the demonstration of the spirochete, radical treatment accurately controlled by the Wassermann, luetin, and provocative Wassermann tests is the ideal in the treatment of syphilis, and the nearer we are able to approach this ideal the less will be the time lost directly and indirectly, because of this protean disease." Again, "A sufficient interval has now elapsed since the introduction of salvarsan and proper methods of diagnosis for experience to accumulate."

With the above ideal in mind, a study of the 300 medical records of the enlisted personnel of the U. S. S. *Mississippi* showed the entry of syphilis in 18 records, and in the personnel 2 suspicious venereal sores. These were cases that had received their infection from a few days to over four years before the examination was made. Of these 20 cases, 7 had symptoms, 13 had none, 2 had suspicious histories, 14 had definite histories, 4 had vague or indefinite histories, 13 had been treated, 6 had not, 1 denied any treatment. The story of diagnosis and treatment in these records and in the patients' statements was studied, and for each case was sought the practical application of the ideal of management quoted above.

The 20 cases naturally fell into two classes: First, cases without symptoms; second, cases with symptoms. Tables 1 and 2 give the data obtained.

A close review of these tables brought to mind many problems that pressed for solution. Were they all syphilis? Had they been sufficiently treated? What tests were necessary to assist in the management of each case? What further treatment was indicated? Were any of them cured?

Consulting the Studies of Syphilis for an answer to the questions, it was possible to draw certain rules from the accumulated experience and opinions contained therein, and these rules were set down and applied to the above-mentioned cases. That the rules are correct in every detail may be a matter for discussion, but that they represent an advance and a remarkable change from the dictum of a few years ago is certain. Time and a greater mass of experience will test their ultimate value. For the present it is enough to apply them to actual cases.

TABLE 1.—*Cases without symptoms.*

Case No.	Time since primary.	Diagnosis by			Treatment.					Time since last treatment.	Wassermann after treatment.	Freedom from relapse.	May 31, 1914.	
					Mercury.			Salvarsan.						
		Treponema.	Secondaries.	Wassermann.	Inunctions.	Pills.	Hypodermic.	Doses.	Grams.				Wassermann.	Luetin.
1	9 years	No	(?)	No	None			One	(?)	$1\frac{1}{2}$ years	Not taken	9 years		Negative.
2	7 years	No	(?)	No	do.			None	None		2 negative	7 years	Negative	Do.
3	3 years	No	(?)	No	do.			None	None		Negative	3 years	do	Do.
4	do	No	(?)	No			2 months	Two	(?)	2 years	Not taken	2 years	do	Do.
5	4 years	No	Yes	No		6 months	4 weeks	Three.	(?)	3 years	do	3 years	do	Do.
6	do	No	Yes	No	6 months	2 years		Two	1.2	2 years	do	do	do	Do.
7	$2\frac{5}{12}$ years	No	Yes	No	$1\frac{1}{2}$ months	3 months		One	0.6	$2\frac{3}{12}$ years	do	$2\frac{1}{2}$ years	do	Do.
8	2 years	No	Yes	Yes	2 months	6 months		One	0.6	1 year	do	$1\frac{1}{2}$ years	do	Do.
9	$1\frac{4}{12}$ years	No	Yes	Yes	4 months	1 month	2 months	None	None.	6 months	do	8 months	+	Positive.
10	8 months	No	Yes	Yes	1 month		2 weeks	Two	1.1	5 months	do	7 months	++	Do.
11	9 months	No	Yes	Yes	2 months	2 weeks		One	0.6	6 months	++ +−	do	++++	Negative.
12	$1\frac{4}{12}$ years	No	Yes	Yes	5 months		5 months	Ten	7.5	5 months	Negative	1 year	Negative	Positive.
13	6 months	No	Yes	Yes			2 months	Five	3.0	$1\frac{1}{2}$ years	do	4 months	do	Negative.

TABLE 2.—*Cases with symptoms.*

Case No.	Time since primary.	Stage of disease.	Description of case.	May 31, 1914.	
				Wassermann.	Luetin.
14	(?)...........	Tertiary....	Crescentic ulcer of skin of arm; denies history of primary or secondary symptoms; denies antisyphilitic treatment.	+	Refused.
15	$2\frac{9}{12}$ years....	Secondary or tertiary.	Papular eruption of skin; a relapse $2\frac{1}{2}$ years after; treatment of 7 months mercury and 1 dose salvarsan; original diagnosis made on appearance of primary lesion; treatment begun before appearance of secondaries.	++	Positive.
16	$2\frac{1}{2}$ months...	Secondary ..	Healed initial lesion; adenopathy general; eruption; headache, anemia, loss of weight.	+++	Not taken.
17	$2\frac{1}{2}$ months..	Early secondary.	Healed initial lesion; adenopathy; anemia, loss of weight; had been treated with protoiodid two weeks and neosalvarsan 2 doses.	Negative....	Positive.
18	2 months....	Late primary.	Healed initial lesion; adenopathy local; no treatment.	++++	Negative.
19	$1\frac{1}{2}$ months...	Primary(?)..	Suspicious healed sore; adenopathy local; no treatment.	Negative....	Do.
20	2 weeks.....	Primary(?)..	Suspicious open sore..................	....	Do.

THE RULES AND THEIR APPLICATION.

RULE I: The primary lesion of syphilis can not be diagnosed or excluded by the appearance of the lesion alone.

Case 20: A suspicious primary sore two weeks after exposure to infection; treponema not found in lesion; too early for Wassermann or luetin tests to be of value. Indication: Continue search for treponema and have a Wassermann taken.

RULE II: Mercurials and salvarsan, either locally or internally, should never be used in the presence of a venereal sore until it is proven to be syphilis.

Case 19: A healed suspicious primary sore, with local adenopathy, one and a half months after exposure to infection, treponema not found, Wassermann negative, luetin negative. Indication: No treatment, other Wassermann tests, and observation for secondaries.

RULE III: Every suspicious venereal sore should be examined for the *Treponema pallidum.* If found, the lesion is syphilitic, and should be treated at once actively, with the hope of aborting the disease. If not found, syphilis is not excluded. When the *Treponema pallidum* is not found every suspicious venereal sore should be kept under observation, without treatment by mercury or salvarsan, and more than one Wassermann reaction taken. If three months elapse from the date the sore was contracted without the appearance of secondary symptoms, and if at this time the Wassermann reaction is negative, syphilis can be excluded, provided no salvarsan or mercury treatment has been given. Should a positive Wassermann reaction appear at any time during this period of observation, the diagnosis of

syphilis should be made and treatment begun. (Exceptions: Yaws, relapsing fever, leprosy, and certain malarial infections during the febrile stage give a positive Wassermann.)

Case 18: A healed primary lesion, with local adenopathy, two months after primary was first noticed. A positive Wasserman has proven the diagnosis. The luetin is negative because the infection has not yet reached the full secondary stage. Indication: Intensive salvarsan-mercury treatment.

Rule IV: With symptoms of supposed secondary syphilis, whether treated or untreated, a positive Wassermann reaction confirms the diagnosis and indicates the necessity for treatment. A negative Wassermann reaction does not exclude syphilis. Several negative Wassermann reactions, persisting several months, in the absence of new symptoms, may be taken as conclusive evidence that the symptoms are not syphilitic, provided no specific treatment has ever been administered. If the case has been treated at any time with salvarsan or mercury, the luetin tests and the provocative Wassermann tests will be necessary absolutely to exclude the necessity for further treatment.

Case 17: Symptoms of secondary syphilis two and a half months after appearance of primary lesion, modified by two weeks of protoiodid and two doses of neosalvarsan; Wassermann negative because of the treatment received; positive luetin indicates incomplete treatment. Indication: Continue intensive salvarsan-mercury treatment.

Case 16: Well developed symptoms of secondary syphilis, diagnosis confirmed by a positive Wassermann. Indication: Intensive salvarsan-mercury treatment.

Rule V: With symptoms of supposed teritiary syphilis a positive Wassermann reaction is diagnostic of syphilis; a negative Wassermann does not exclude syphilis. With a negative Wassermann in such cases a luetin test, if positive, confirms the diagnosis; if negative a provocative Wassermann may be necessary. Several negative Wassermann reactions repeated for a period of many months, after all salvarsan-mercury treatment has been stopped and during which period no new symptoms have developed, indicate the necessity for a luetin test and a provocative Wassermann to establish the fact of a cure.

Case 15: Relapse, late secondary or tertiary symptoms in a case originally diagnosed by the appearance of a supposed primary lesion contracted two years and eight months ago; treated by seven months of mercury and one dose of salvarsan; free of symptoms two years and six months. A positive Wassermann proves the diagnosis: a positive luetin adds to the proof. Indication: A second course of intensive salvarsan-mercury treatment.

Case 14: Supposed tertiary lesion in a patient who denies all history of syphilis or of antisyphilitic treatment; lesion healed under mercurial inunctions and potassium iodid after which a positive Wassermann reaction occurred; luetin test refused by patient, but its evidence was unnecessary. Indication: Salvarsan followed by mercury and potassium iodid.

Rule VI: If no symptoms of syphilis are present and an indefinite or no history of infection, and if no specific treatment has ever been administered several negative Wassermann reactions exclude syphilis, except in some latent forms of cerebrospinal syphilis, in which case a negative Wassermann reaction of the spinal fluid would exclude syphilis and a negative luetin and a negative provocative Wassermann would be additional proof. If the case has been treated a negative luetin or a negative provocative Wassermann excludes syphilis.

Case 1: No history of syphilis, but one of chancroid nine years ago. Discovery of salvarsan led the patient to request treatment one and a half years ago; one dose of salvarsan given, no mercury; patient free of symptoms nine years. Wassermann was not taken, luetin negative. Indication: Probably never had syphilis, a negative provocative Wassermann would give additional proof, but is not indicated because of the negative luetin after treatment.

Case 2: Indefinite history of syphilis seven years ago; no symptoms for seven years, no treatment; two negative Wassermann reactions two years ago; a negative Wassermann and negative luetin prove the patient probably never had syphilis.

Case 3: History of operation for bubo three years ago followed by orchitis and preceded by gonorrhea; no treatment; no symptoms for three years; a negative Wassermann one year ago. A negative Wassermann and luetin test to-day indicate that the diagnosis of syphilis was probably erroneous.

Case 4: History of chancroid two years ago followed by bubo. An obstinate sore throat two years ago led to a diagnosis of syphilis and the administration of mercury for two months and two doses of salvarsan followed. He was free of symptoms for two years. A negative Wassermann to-day indicates either erroneous diagnosis or necessity for further Wassermann tests. The negative luetin greatly strengthens the probability that the case is not syphilis.

Rule VII: If no symptoms of syphilis are present and there is a definite history of treated syphilis, a positive Wassermann reaction means incomplete treatment; a negative Wassermann reaction means nothing. Several negative Wassermann reactions persisting through a year after treatment has been stopped, without the recurrence of suspicious symptoms, are good evidence that the treatment has been effective.

Case 5: History of primary lesion four years ago; diagnosed as syphilis by the appearance of secondaries; treated with seven months of mercury and three doses of salvarsan; free of symptoms three years, after which there is now a negative Wassermann and negative luetin. Indications: Negative Wassermann alone would indicate necessity for more negative Wassermann tests. The negative luetin test gives good evidence of sufficiency of treatment.

Case 6: History of primary lesion four years ago; diagnosed as syphilis by the appearance of secondaries; treated two years and six months with mercury and given two doses of salvarsan, 0.6 grams each dose; free of symptoms three years; after which there are now negative Wassermann and luetin tests. Indication: Same as case 5.

Case 7: History of primary lesion two years and eight months ago; diagnosed by the appearance of secondaries; treated four and a half months with mercury and one dose of salvarsan, 0.6 gram; free of symptoms two and a half years, after which there are now negative Wassermann and luetin tests. Indication: Same as case 5.

Case 8: History of secondary syphilis a year and a half ago, appearing about four months after a venereal sore; diagnosis confirmed at time of secondaries by a positive Wassermann; treated eight months with mercury and given one dose of salvarsan, 0.6 gram: free of symptoms one and a half years, after which there are now negative Wassermann and luetin tests. Indication: Same as case 5.

Case 9: History of secondary syphilis a year ago, appearing about three months after a venereal sore was first noticed; diagnosis confirmed at the time of secondaries by a positive Wassermann; treated five months with mercury and given no salvarsan; free of symptoms eight months, after which there are now positive Wassermann and luetin tests. Indication: Insufficient treatment. Give second course of treatment.

Case 10: History of primary lesion of the lip eight months ago; diagnosed by the appearance of secondaries and a positive Wassermann; treated one and a half months with mercury and given two doses of salvarsan, 1.1 grams in all; free of symptoms seven months, at the end of which period the Wassermann and luetin are positive. Indication: Insufficient treatment. Give second course of treatment.

Case 11: History of a primary lesion nine months ago, diagnosed by the appearance of secondaries and a positive Wassermann; treated two and a half months with mercury and given salvarsan one dose 0.6 gram. This course of treatment was followed by a doubtful Wassermann. He was free of symptoms seven months; now the Wassermann is positive and the luetin negative. Indication: Insufficient treatment. Give second course of treatment.

Case 12: History of secondary syphilis, appearing about one year ago and six months after a urethritis which was probably a primary lesion in the urethra; diagnosis confirmed by a positive Wassermann:

treated for five months with both inunctions and hypodermics of mercury, and given 10 doses of salvarsan, 7.5 grams in all; this course of treatment was followed by a negative Wassermann. He was free of symptoms for one year and now has a negative Wassermann and a positive luetin reaction. Indication: The negative Wassermann indicates possible sufficiency of treatment. The positive luetin test indicates insufficient treatment. Another course of salvarsan and mercury should be given until a negative luetin test is obtained.

Rule VIII: A cure of syphilis is present when a case has been "one year without treatment, without any suspicious clinical signs. with several negative Wassermann reactions, and no positive ones, and with a negative provocative Wassermann reaction and negative luetin test at the end of the year."

Case 13: History of secondary syphilis appearing at the proper interval after a primary lesion contracted six months ago; diagnosis confirmed by a positive Wassermann; treated with hypodermics of mercury for two months and given five doses of salvarsan, 3 grams in all; a negative Wassermann present at the end of this course of treatment; free of symptoms for four months with now a negative Wassermann and negative luetin. Indication: Possibly sufficient treatment. More than one negative Wassermann test and no positive ones for one year, followed by a negative luetin and a negative Wassermann test will establish the fact of a cure.

RULES FOR LUETIN TESTS, WITH ILLUSTRATIONS.

The rules for interpretation of luetin tests were deduced from its use in 50 cases reported in Studies of Syphilis. With illustrations, they are as follows:

Rule 1: In the early primary stage luetin is negative. Illustrations, cases 20 and 19.

Rule 2: In the late primary and early secondary stage, without treatment, it may be negative or positive. Illustration, case 18.

With treatment it is apt to be positive. Illustration, case 17.

Rule 3: In the secondary stage without symptoms, after treatment, when Wassermann is negative, a positive luetin means insufficient treatment. Illustration, case 12.

When Wassermann is positive, a positive luetin is valuable but not needed. Illustrations, cases 9 and 10.

When in this stage the luetin test is negative with a positive Wassermann, the luetin test means nothing. Illustration, case 11.

When in this stage the Wassermann is negative and the luetin is negative, it is presumptive evidence of a cure; but a provocative Wassermann is necessary to establish fact of a cure. Illustrations, cases 5, 6, 7, 8, and 13.

Rule 4: In supposed latent and tertiary cases a positive luetin test indicates syphilis. Illustration, case 15.

A negative luetin test suggests error in diagnosis or possible cure. Illustrations, cases 1, 2, 3, and 4.

PLAN OF TREATMENT.

The exact treatment followed in the cases here reported need not be stated, and in fact it is now but just begun. The treatment being administered is based on the plan of treatment set down in Studies of Syphilis.

"PRIMARY STAGE: (*a*) With negative Wassermann—that is, within a week or two of the appearance of the chancre—two full doses of salvarsan (or neosalvarsan) with an interval of one week; one month of intensive treatment with mercury by inunctions or injections. (Excision of the chancre if the location permits.) (*b*) With a positive Wassermann reaction and glandular enlargement, three full doses of salvarsan at weekly intervals; six weeks intensive treatment with mercury.

"SECONDARY STAGE: Four to six full doses of salvarsan in two months with intensive treatment with mercury.

"LATENT AND TERTIARY STAGE: The chances for success of radical treatment are not as good as in the earlier cases, but a single course of treatment can be given as in the secondary stage and repeated when necessary, as indicated by symptoms or by a positive Wassermann reaction."

Of the influence of treatment upon these cases nothing need be said. They can all be brought quickly to the negative Wassermann stage. A year and probably more time must elapse before they can all be brought to the ultimate goal of treatment—a cure—while the results of a generation of this sort of management will be needed to determine whether the standard of cure is or is not a perfect standard.

While nothing new can be claimed for this review of cases, it is thought a description of a practical application to actual cases of the opinions contained in the Studies of Syphilis may be of interest. The rules may not be correctly deduced from the opinions expressed or the opinions themselves may be open to discussion and the evidence upon which they are based be disputed; but it is desired to point out that the task of assembling the facts of diagnosis, treatment administered, and progress toward cure made in any given 20 cases is not a light task or one quickly accomplished; yet each doctor who would properly manage a case of syphilis must have these facts in order to form his own estimate of the management necessary.

In the naval service the medical records of the naval personnel are well kept, yet nearly one-third of the facts in these 20 cases had to be gleaned from the patients' stories, and this is due to the never-ending flow of men and medical officers changing ship and station, which is the rule in the service. Important entries relating to diagnosis, treatment, and tests made are recorded by a series of doctors as the man

passes from hospital to ship or from ship to ship or doctor to doctor. Any one case of syphilis may be and often is seen in the primary stage by one doctor, in the secondary by another. Treatment may be begun by one doctor and carried on by another. The tests of efficiency of treatment may be recorded by still other doctors. Each case thus must be taken up afresh perhaps several times by several doctors during the year or more necessary to establish a cure. The opinions of several doctors as to details of the treatment and management may vary slightly, but the facts upon which they base their opinions do not vary.

To meet this condition of change a special form for recording the diagnosis, serum reactions, progress of the case, etc., could be issued and placed in the health record of every man who has syphilis, either active or latent, and kept in his record until he is cured.

Such a form should show the date and give the name of the observer of the primary lesion; the finding of the treponema, the adenopathy, rash, or other symptoms; the Wassermann or other reactions upon which the diagnosis rests. It should have a place for subsequent Wassermann, luetin, or other tests of the efficiency of treatment, and it should not be closed until it contains definite evidence of a cure.

The Army at present has a form called the "Syphilitic Register,"[1] which has many good features, but it is not as complete as it might be for our purposes. Some of the advantages of such a form in our medical records would be—

1. To gather into one place in the record the data upon which treatment is based.

2. To facilitate the finding of all cases of syphilis on board ship or at a station that are in need of either further treatment or tests.

3. To emphasize the importance of careful recording of the salient facts in the progress of a case of syphilis.

4. To help each doctor who has the case in his care to make his treatment continuous with that of the doctor who preceded him.

5. To allow each doctor to base his treatment or observation on recorded facts rather than on the patient's history.

6. To have a record which will at any time refute a patient's statement that he "doesn't think he ever had syphilis," a statement often made when he feels perfectly well after one or two doses of salvarsan that have caused symptoms to disappear but have not cured him.

7. To carry facts about a case of syphilis across the gap in the medical record which now appears when the patient reenlists before a cure is reached.

8. To make a place for the collection of evidence to show how far the case has advanced toward a cure.

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[1] See p. 665.

61713—14——6

SUGGESTED FORM.

(Page 1.)

Place__________________ Date__________________
Name ____

SYPHILIS RECORD.

INSTRUCTIONS.

1. This record of syphilis will be opened in every case on the day diagnosis is made, no matter what the stage of the disease. If the patient has been treated for syphilis before this record is made out, the data required will be obtained from the health record and from the patient's history.

2. The purpose of the record is to give a concise story of the diagnosis and of the exact stage of the disease, so as to enable any medical officer quickly to marshal the facts upon which to base his treatment of the case.

3. The rapidity with which all subjective and objective evidences of syphilis disappear under a combined salvarsan and mercury treatment has a tendency to minimize the patient's realization of the necessity for prolonged treatment and observation. For this reason a careful, tactful explanation of the nature of the disease, syphilis, and of the treatment proposed should be made to the patient at the time he is asked to sign the statement on page 3 of this form.

4. This record will follow the same course as the abstract of the health record and will be inserted when opened in the health record just after the abstract of health record.

5. This record is additional to and in no way replaces the health record. The entries of "line of duty" and "sick days" will be recorded as for other diseases, and treatment administered for syphilis will be noted in the usual manner and place.

6. The present standard of cure is one year without treatment, without suspicious signs of syphilis, no positive Wassermann reactions, and several negative Wassermann reactions, followed by a negative provocative Wassermann test and a negative luetin test at the end of such a year.

(PAGE 2.)

PRIMARY LESION.

Site____

Contracted at_____________________________________

(Date.)

First noticed by patient____________________________

(Date.)

First seen by medical officer______________________

(Date.)

____

____

(*Surgeon, U. S. N.*)

DIAGNOSIS.

Treponema pallidum_____________________________

____

(Method.) (Date.)

____

(*Surgeon, U. S. N.*)

Secondaries_____________________________________

(Date.)

Adenopathy_____________________________________

(Date.)

Eruption_______________________________________

(Date.)

Mucous patches_________________________________

(Date.)

Other____

(Date.)

____

(*Surgeon, U. S. N.*)

Wassermann_____________________________________

(Result.)

____

(Reported from.) (Date.)

____

(*Surgeon, U. S. N.*)

Other evidence__________________________________

____

____

(*Surgeon, U. S. N.*)

Place .... Date ....

Name ....

The nature of the disease, syphilis, has been explained to me, and I am convinced that I have this disease. I have been told that prolonged treatment and several tests will be necessary for a cure. I am anxious and ready to take such treatment as may be necessary.

....
(Signature of patient.)

Serum reactions.

Where made.	Reaction.	Date.

(PAGE 4.)

EFFECT OF TREATMENT.

(Place.) (Date.)

A course of treatment ending this date has resulted in a negative Wassermann reaction.

(*Surgeon, U. S. N.*)

RELAPSES AND SUBSEQUENT COURSES OF TREATMENT.

(Place.) (Date.)

A year having elapsed since treatment was stopped, no suspicious signs of syphilis having appeared, and negative Wassermann reactions having been reported during this year, a provocative Wassermann and luetin test are recommended.

(*Surgeon, U. S. N.*)

Provocative Wassermann------------------------

Luetin --

(*Surgeon, U. S. N.*)

SYSTEMATIC RECORDING AND TREATMENT OF SYPHILIS.

The Advisability of a Separate Abstract in the Health Record and of a Standard Treatment for Syphilis.

By A. M. Fauntleroy, Surgeon, and E. H. H. Old, Passed Assistant Surgeon, United States Navy.

The purpose of this article is to suggest means whereby members of the Medical Corps of the Navy can cooperate in treating cases of syphilis and in following up the histories of such cases more scientifically than is done at present. The histories in health records often contain the single entry "usual treatment" or "mercurial treatment started," or some such wording which means very little to the next medical officer who has charge of the case. In the majority of instances the patient is relied upon to tell what he received, how long he received it, and, in fact, the many important details necessary to be known in order to carry on this type of case in a scientific manner. If he has been transferred several times during a year or two years, he gives usually a history of having had injections of mercury on one ship, protoiodid pills or mixed treatment on another, mercurial ointment rubs on another, and possibly that he was several months somewhere when he was not treated at all, the fact that he has syphilis having been overlooked as the patient did not call attention to himself; for we all have seen many who think that so soon as their rash disappears they are cured and further treatment is not necessary. Furthermore, all of us have doubtless had the experience of having a case that has been diagnosed somewhere as syphilis, and yet, when the patient is asked about it, he denies he ever was infected, and when the history is read there is nothing in it of a confirmatory nature, only the simple diagnosis and "usual symptoms," or some other wording equally unconvincing being recorded. Such a patient gives an unsatisfactory history and, if there are no satisfactory signs present at the time, one is usually at a loss what to do until a Wassermann test can be made. In addition to this there is always the chance of a health record being filed before it is read by the medical officer to find out if there has ever been such an infection recorded, and consequently a percentage of such cases may receive no treatment for a considerable period, or until the progress of the case attracts attention.

In order to obviate the inconsistencies to which attention has been called, and there are others of like nature that can probably be remembered by many, it is believed that a so-called "luetic abstract" of the same size as the sheets in the health record, but on colored paper (blue or pink or some other color), that can be filed in the record, would be of great assistance. A health record received with such a sheet would be immediately recognized and the case called to the attention of the medical officer forthwith.

In the event of reenlistment this abstract, provided such a case has not been pronounced cured, should be removed along with the regular general abstract and filed in the new health record, as is now done in the latter instance; if the reenlistment occurs sometime after discharge, then the "luetic abstract" should be forwarded from the Bureau of Medicine and Surgery along with the regular general abstract, as is done at present. In this way we would always have the history and treatment of such cases before us.

It is further believed that a regular systematic treatment for these cases should be carried on in the Navy so far as is practicable, and that some standard should be adopted in order that when a case passes from one medical officer to another the latter can take up the same course of treatment just where the former left off. In this way we will be able to tell a patient, when he starts treatment, about how long such will be necessary and exactly what he can expect, provided complications do not intervene. As mentioned before, a case may have received during one year several different kinds of treatment, due to the difference in opinion of those under whose observation he has come, and it is believed that all will agree that such a precedent is not to the patient's advantage; in fact such patients are at times skeptical as to whether any one of the methods is worth while or necessary. Certainly, opinions given him regarding kind and length of treatment are very varied.

In arriving at a proposed standard treatment the question of protoiodid pills or mercury in any form by mouth can be ruled out, for such treatment is a thing of the past to all save an exceedingly small minority. Inunctions, while considered the best form of administration by many, are not considered practicable from the naval point of view, except when a case is in a hospital. They have to be given daily, and their uncleanliness makes them especially objectionable.

Intramuscular injection is considered the most desirable form of administration; but is it debated as to which is preferable, the soluble or insoluble salts of mercury when given in this manner. The soluble salts require two or three injections a week and in addition are not considered as curative and are more liable to cause salivation than the insoluble. Then, too, the insoluble salts, and of these the salicylate of mercury is considered superior to calomel, are given only once a week. Certainly, the advantage of having to get these patients to the sick bay only once a week on a certain day to which they become accustomed, and the fact that they do not have to be "jabbed with a needle" so often make this form of procedure much the most desirable.

The salicylate is the form used in the leading clinics in Vienna and Berlin and in many in New York City. Among the latter special

mention can be made of the Rockefeller Institute, where it is constantly used along with salvarsan in their experiments regarding the best course of treatment with these two drugs in order to obtain a cure for this disease. A number of medical officers in the Navy are using it now and have been so using it for years, so it is not mentioned here with the idea of introducing anything new, but merely to point out the fact that in case a standard treatment is selected the salicylate injections would prove the most advantageous.

With the foregoing in view, a "luetic abstract" and a "standard treatment" have been drafted and are here presented in this article for consideration and possible recommendation.

The abstract is to have on the front of it the following items for answer and recording, suitable spacing being allowed, and the amount of writing that will be necessary reduced to the minimum:

Name: ________________ Rate: ________________
Location of initial lesions: ____________________
Date of initial rash: __________________________
Glandular enlargement (location; character): ____
Treponema present: ___________________________
Wassermann or Noguchi (dates and results): ______
Treatment: ___________________________________
Remarks: ____________________________________

The abstract is to have on the back the following "instructions":

This abstract to be made out for all cases of lues, and secured in health record. This record is in addition to the usual entries that should be made in health record.

TREATMENT TO BE FOLLOWED.

FIRST YEAR: Intravenous injections of salvarsan when possible.

Three "courses" of intramuscular injections of salicylate of mercury; a "course consists of one (1) grain, suspended in sterile paraffin oil or liquid petrolatum, once a week for eight weeks.

SECOND YEAR: Two courses four months apart.

THIRD YEAR: Two courses four months apart.

Wassermann test to be taken at four or six months' intervals and recorded under that heading.

Record under "treatment" the dates of beginning and ending of a course, and whenever salvarsan injected. If the above treatment is contraindicated the medical officer may deviate from same at his discretion, but it should be noted under "treatment."

The syringe for giving the intramuscular injections is already on most of the ships, and, if not, can be obtained on requisition, as it is carried on the supply table as "syringe, intramuscular, metal," and "syringe, intramuscular, all glass," the former being the more substantial. Petrolatum liquidum and hydrarg. salicylas are also on Form B.

It is realized that the Wassermann and Noguchi tests can not be done aboard ship; but whenever a ship is near a naval hospital or the hospital ship such can readily be obtained by inquiring as to the day on which these tests are made and sending the patients or the required amount of blood. In the latter instance it is advisable first to find out exactly how much is necessary, as some wish 5 c. c. and others 10 c. c. For those not familiar with the technique of obtaining blood for such work it is better to send the patients to the laboratory or for the medical officer first to go there and observe the method himself. To be able to take the specimens of blood aboard ship and send them to the laboratory will save a great deal of time and especially the necessity of arranging for a number of men to be absent from the ship during working hours.

As regards salvarsan, it is considered that at least one, and better two, intravenous injections should be given; more can be given at the discretion of the medical officer.

In the case of diagnosis in the primary stage, salvarsan should be given immediately, followed by a second injection in 10 days or 2 weeks. This treatment should be followed by three courses of treatment as outlined in the instructions on the back of the "luetic abstract." Further treatment is to be determined by results of Wassermann reactions taken every 4 or 6 months for a year.

In secondary cases it is advisable to give the salvarsan after at least a month's treatment with the intramuscular injections of salicylate of mercury. A second dose can be given at the end of the first course of treatment.

It is believed that facilities for obtaining salvarsan for these patients should be extended. It is appreciated that it is not always convenient to transfer such patients to a hospital, as in many instances it means interfering with the personnel of a ship's crew, and to keep this personnel intact as far as possible is one of our important duties. The ships are often far away from either a hospital or hospital ship, and may be so isolated for months. When such is the situation, and a case reports at the sick bay with mucous patches in the mouth, it is then that salvarsan is immediately necessary for the prevention of possible innocent infections, for all doubtless appreciate its remarkable effect in healing such lesions. In regard to the best means whereby this treatment can be obtained more readily, the following recommendations are made.

1. That salvarsan and the necessary materials for its administration be supplied to at least all first-class ships.

Should a ship without such facilities be at a distance from a hospital or hospital ship, but near a ship equipped for this work, it is thought that it could be so arranged through the respective commanding officers that a man could be transferred for a few days in order that he might obtain the benefit of this treatment.

2. That it be arranged by necessary orders so that such cases can be sent from a ship to a hospital for an injection of salvarsan without the patient being detached from the ship; which will mean that he will be able to return in few days, as is the case at present when patients are sent to the hospital ship. It could be stated in the health record that such a case was transferred only for the purpose of receiving an injection of salvarsan, and with proper cooperation on the part of those in the hospitals it would mean only two or three days at the most before the man could return to his ship. Should an occasion arise in which it would be advisable to retain such a patient in a hospital for a longer period than was at first thought necessary, the medical officer in command could then notify the commanding officer of the ship in order that the regular papers and effects of the patient be transferred in the usual manner.

In regard to the relative values of salvarsan and neosalvarsan in this work, the following letter recently received from the hospital of the Rockefeller Institute in New York is quoted in full:

> We feel that salvarsan is of greater value than neosalvarsan. Experimentally it has been shown in Ehrlich's laboratory that two units of arsenic in the form of neosalvarsan are required to do the work of one unit of arsenic in the form of salvarsan in the cure of experimental syphilis in rabbits. Clinically, in early syphilis, a negative Wassermann reaction is more often secured after salvarsan. Doubtless by increasing the dose of neosalvarsan the same effect can be obtained, but here again we are subjecting the patient to a larger dose of poisonous drugs and toxic symptoms often appear. The only advantage of neosalvarsan is in the ease of preparation and administration.

ORGANIZATION AND STATION BILLS OF THE U. S. NAVAL HOSPITAL SHIP "SOLACE."

By W. M. Garton, Surgeon, United States Navy.

The naval hospital ship is, and is regarded as, a naval hospital afloat. Naturally, its organization should correspond to one ashore. There exists a uniformity of organization of our hospitals, but not a definite internal administration.

Having taken for granted that the Medical Corps is thoroughly familiar with the plans and construction of the *Solace*, I shall endeavor to describe its internal organization as it exists to-day, and

which proved so efficient when called upon during the engagement at Vera Cruz.

The Staff: The medical staff of the *Solace* consists of seven medical officers, one dentist, and one pharmacist. The commanding officer is in command of the ship and the administration of the Medical Department. The master, his officers, and crew have control of that part of the ship which relates to navigation, as set forth in Navy Regulations, which also includes the commissary department. This latter will be taken up separately.

The efficiency of the hospital ship depends not alone upon the skill of its staff, but also upon the spirit of contentment and loyalty to the commanding officer. Teamwork also has a great share, and a hospital ship with a mutual admiration association is bound to get results and petty jealousies can not exist.

THE DUTIES OF THE EXECUTIVE SURGEON.

According to the Handy Book for the Hospital Corps of the Navy, the duties of an executive surgeon are defined as—

> The executive surgeon has charge of the junior medical officers, Hospital Corps, Nurse Corps (female), and all patients, civil employees, and all departments of the hospital, and is directly responsible to the commanding officer for the discipline and management of the personnel and the conduct of all other affairs of the hospital.

This is more elaborately defined in the Manual of Instructions for Medical Officers, which is in reality a "shall" and "shall not" instruction; and I shall try to describe a daily routine for the executive surgeon instead.

Before 8.30 a. m. an inspection of the ship is made, which includes the different departments, to see that everyone is at work preparing for the 9 o'clock sick call. Arriving at the executive surgeon's office, the night report books are carefully scrutinized, notes being taken when necessary as to the condition of various patients, with the purpose of talking over cases with the medical ward officers and reporting their condition to the commanding officer.

In regard to the night report book, each ward—which will be described in full later, and which includes surgical, medical, contagious, and sick officers' wards—has an individual night report book, kept by the night hospital apprentice, beginning at 9 p. m. and ending at 7 a. m. Entries are made every hour or oftener if necessary, depending altogether upon the condition of the patients. A sample of the night book is appended, marked "A." The night books are turned in at the executive surgeon's office before 8 a. m.

In addition to these books there is a report book kept by the supervising night apprentice, who inspects the Medical Department at

least every hour. A copy of this night report, with his instructions, is appended, marked "B" and "C," respectively.

8.30 a. m. The executive surgeon receives the morning report of the master at arms and gives him orders for work to be completed or contemplated, and instructions regarding the Hospital Corps.

The night report books are carefully gone over and notes are made when such are necessary.

9.30 a. m. The medical officers make their reports as to the condition of the patients in their respective wards. It is at this time the executive surgeon discusses the condition of patients with the different ward officers.

A total sick and absentee report is submitted to the commanding officer prior to 10 a. m. When practicable, all official mail is gone over in the morning prior to being sent to the commanding officer.

10 a. m., or as soon thereafter as practicable, the executive surgeon reports to the commanding officer. This report includes matters pertaining to the junior medical officers, the condition of the patients, the Hospital Corps, the sanitary condition of the ship as a whole, the Medical Department from a professional viewpoint, work under way and new work contemplated. He then receives instructions from the medical officer commanding as to his wishes for administration on other matters pertaining to his command.

10.30 a. m. The executive surgeon starts on his daily inspection of the ship and generally finishes about 11.30 a. m., trying to time himself so he will be present near the galley when the noon meal is being served there. This daily inspection is of the utmost importance and should be done in a most conscientious manner, paying particular attention to the general sanitary condition of the ship, the cleaning routine, the personal cleanliness of the Hospital Corps, the general upkeep of the Medical Department, and making such an examination as he deems necessary of the serious cases noted in the night report book. The convalescent patients who are detailed for light duty must be present at their stations in order that they may receive orders as to what is required of them. Patients are returned to duty and are not retained aboard ship longer than is absolutely necessary.

In the afternoon, besides an inspection, the official mail is gone over, repairs under way supervised, property books, surveys, inventory reports, and requisitions checked over, and other matters relating to the Medical Department as a whole.

An evening inspection is made when deemed necessary, at different times, in order that he may see that everything is in good condition and discipline is maintained.

9 p. m. The medical officer of the day makes his 9 o'clock report, lights out, absentees, and all secure for the night. The executive surgeon then makes his report to the commanding officer and receives what orders the commanding officer may deem necessary.

DUTIES OF THE MEDICAL OFFICER OF THE DAY.

The duties of the medical officer of the day, as clearly defined in the Manual of Instructions for Medical Officers, are applied aboard this ship with some slight modifications; for example, while under way there is no necessity of being constantly in the officer of the day's office, but while at anchor he carries out the instructions more closely.

7.30 a. m. The officer of the day inspects breakfast, noting the quality and quantity as well as the condition of the food, and the manner in which it is served. He also satisfies himself that the apprentices are on duty and as to the condition of the patients.

8.45 a. m. Sick call is held.

10 a. m. The officer of the day is relieved by his successor; having turned over the necessary orders and completed the medical journal, which he has signed, he sends it to the executive office for the approval of the commanding officer.

12 m. The dinner is inspected, making the regular entries in the medical journal.

The admission, transfer, and discharge of patients is under his supervision, and all ingoing and outgoing official papers are transferred through him. Such reports as necessary regarding patients, either admitted, discharged, or transferred, are reported to the executive surgeon.

5 p. m. Supper inspection with usual entries.

7 p. m. Sick call.

9 p. m. He receives the reports from the master at arms, the supervising apprentices of each ward, and instructs the hospital apprentices detailed for night duty as to treatments, prisoners, and such other matters as are necessary. He then makes his report to the executive surgeon.

The officer of the day should consider that his duty is one of great importance. He should be always willing to take the initiative, as the smooth running and efficiency of the ship greatly depend on the manner of his performance of duty.

In describing the duties of the medical officers of the staff of the *Solace*, it is well to note that each specializes in a certain line. In this way consultations are frequent, and a medical officer does not hesitate to ask for consultation regarding an obscure or serious case. Their duties will be taken up in conjunction with a description of the different wards.

OPERATING ROOM.

The operating room and surgical ward, with all their equipments and supplies, are under the direct personal charge of the operating

surgeon, the executive surgeon having a general supervision, and when operations, even of a minor character are contemplated, the former reports to the executive surgeon and a time is set for the operation. The executive surgeon then makes a full report to the commanding officer as to the condition of the patient and necessity for the operation. The operating surgeon has detailed a junior medical officer as his assistant and tries as nearly as practicable to have other medical officers either perform or assist in operations.

The direct detail of the operating room is as follows: A hospital steward is in complete charge and is responsible for the upkeep, cleanliness, and general surgical technique. Every month either a hospital apprentice first class, or a hospital apprentice is detailed for a period of two months for instructions in the operating-room technique. This detail is made alternately every month in order that an entire new detail will not be effected at one time. It may be noted that this plan has worked admirably as shown by the results obtained. The technique in the operating room is up to date, the benzine-iodine method of sterilization being used.

SURGICAL WARD.

The surgical ward of this ship is not arranged in such a manner as to divide the septic and aseptic cases, but has one quiet room and a separate surgical dressing room with full equipment.

The surgical technique in this ward is simple, and is under the direct supervision of the operating surgeon. A hospital apprentice is in charge of the dressing room, and special care is taken to see that he is fully instructed in surgical asepsis and antisepsis as well as the other duties of the dressing rooms.

The following written instructions are now in vogue in the surgical ward:

Routine hospital orders, such as ward admission cards, urine to laboratory, etc.

Before operation: Unless there are special orders to the contrary, give light supper; castor oil at 9 p. m.; no water to skin for at least 24 hours prior to operation; dry shave; benzine-iodine method of sterilization of skin. See that patient voids urine just before going to operating room. Give no hypodermic injection before anesthetic unless ordered.

After operation: An apprentice is to remain with the patient until he is well out of anesthetic. Absolutely nothing is to be given by mouth until ordered. No hypodermic or morphin to be given or catheter passed except by special orders. The first specimen of urine voided is to be sent to the laboratory. Temperature, pulse, and respiration are to be recorded every four hours, with complete

clinical notes, until ordered discontinued. Special instructions will be given in each case as to position in bed, treatment, nourishment, and the time the patient is to be allowed out of bed.

The medical officer in charge of ward, or in his absence, the officer of the day, is to be notified immediately in case of unusual or alarming symptoms, hemorrhage, vomiting, etc.

MEDICAL WARD.

The medical ward, of 64-bed capacity, is under the direction of a medical officer who has given special attention to internal medicine. A hospital apprentice, first class, is in charge and has under him hospital corpsmen who receive particular instructions relating to these duties. The equipment of this ward is complete and a section of six beds is screened off and equipped with a large sterilizer for the treatment of appropriate cases. In addition, a quiet room for serious cases has been recently installed. Shower baths have been substituted for tubs and new washbasins, six in number, of the latest sanitary pattern, have been ordered.

The following are the general instructions issued for this ward:

On admission give bath; note temperature, pulse, and respiration. Send specimen of urine to laboratory.

The medical officer of the ward, or officer of the day, is to be called when anything untoward develops and is to see all new cases. Give special attention to diets. Note with care all symptoms. Bed patients are to have a full bath three times daily.

The results obtained have been especially satisfactory.

GENITO-URINARY DEPARTMENT.

A section of the medical ward is used in the treatment of venereal diseases, and the medical officer detailed for this duty pays particular attention not only to the treatment, but also to the special instructions of the Hospital Corps relating to these diseases. Strict quarantine regulations are observed.

The following are the special instructions:

All bed patients will wear nightgowns and at no time are they to wear underwear.

Syphilitic mess gear, etc., applies to the serving of rations in the ward as well as in the convalescent mess hall.

Syphilitic and chancroidal cases needing treatment for gonorrhea shall have separate catheters.

Urethral instrumentation with metallic cathers or sounds shall be undertaken only by the medical officer.

Waxed catheters shall be washed clean and sterilized in a 1:1000 bichlorid of mercury solution; no boiling or carbolic solution for these catheters.

Unless otherwise ordered, rubber gloves, after being thoroughly washed, are to be sterilized in a 1:1000 solution of bichlorid of mercury.

All patients shall be kept flat on their backs for 24 hours after administration of salvarsan, giving only liquid diet and plenty of water. Temperature is to be taken every two hours.

Solutions of argyrol, not larger in amount than to last two days, are to be kept in the ward.

The operating room is used for the administration of salvarsan in all cases, as a strict aseptic technique can be carried out there.

LABORATORY.

The medical officer detailed for laboratory duty has complete charge of and is responsible for the laboratory, and allows no one to have access to same or the use of its equipment without his knowledge. A complete record of all work of whatever nature is carefully kept in a book especially for that purpose.

Under the medical officer in charge are assigned a hospital steward and a hospital apprentice and they are instructed in order that they may fully understand as far as practicable laboratory technique.

The following are the instructions for the laboratory.

All new patients, and all other patients when so ordered by the ward officer, are to have an examination of urine in morning. If not normal, report to the medical officer in charge of laboratory, who will then make a complete urinalysis.

All specimens of sputum, urine, and feces are to be thoroughly mixed with cresol before being thrown out.

After handling sputum, urine, or feces, wash and soak hands carefully in a bichlorid solution.

Use great care in handling glassware to avoid breakage.

If any infectious material is spilled on deck or tables, pour on cresol immediately and wipe it up, being careful to disinfect the hands thoroughly afterwards.

Avoid spilling of stains, etc., and see that the laboratory is kept clean at all times.

See that all specimens brought to the laboratory are properly labeled.

See that no specimens are thrown out without being examined.

Avoid unnecessary waste.

See that the incubator is kept at the proper temperature at all times.

Keep a careful record of all work done in laboratory.

Lock laboratory door upon leaving at night.

Keep card index of property on charge up to date.

Results of all examinations must be submitted to the officer in charge for signature before being sent to the ward officer.

Keep blood-counting apparatus ready for instant use.

Ask for instructions if in doubt.

DISPENSARY.

The dispensary is in charge of a hospital steward and one hospital apprentice is assigned under him for instruction and to assist him in his duties.

All prescriptions, orders for hospital equipment, etc., are entered by the hospital apprentice in a book kept especially for that purpose and are signed by the medical officer requiring them. These books when filled are to be filed away for future reference. All hospital equipment that is on charge is initialed by the executive surgeon before being issued.

All bottles containing medicine are labeled by the hospital steward in charge of the dispensary, and he is held responsible for their contents. The changing of labels on bottles is strictly forbidden, except by the hospital steward.

As each ward has a separate medicine locker, all medicine is therefore always under lock and key. The hospital apprentice in charge of each ward is held responsible for the poisons and liquors that are issued for use in the respective wards.

Medicine glasses are issued for each individual ward, and after being used are washed out and kept in an antiseptic solution until used again.

In the dispensary care is to be taken to see that all poisons and liquors are kept in separate lockers, which are kept locked.

The hospital steward in charge of the dispensary sends an itemized statement every Saturday of all liquor drawn.

Equipment issued and turned in on charge is entered in the individual ward property book.

Individual ward responsibility has proven an excellent plan of keeping track of property issued on charge to every ward.

ISOLATION WARDS.

The isolation wards, three in number, of 30-bed capacity, are very well equipped for the treatment of all contagious diseases. A hospital apprentice, first class, and two hospital apprentices are detailed for duty in this ward. The medical officer who has charge

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of these cases sees that they not only understand carefully the instructions regarding the patients, but also the necessary precautions to prevent infecting themselves or spreading the diseases under treatment.

The following are the rules and instructions:

Each patient on admission will be placed in bed in his respective ward, given a bath, clean pajamas, and a sputum cup. Temperature, pulse, and respiration are to be taken and reported to the medical officer.

All patients will be kept in quarantine for the regular period.

On the last day when patients are discharged to duty they will be given a thorough bath, including hair, afterwards sponged off with a 1:5,000 bichlorid solution. All clothing, including bag and hammock, will be sterilized the same day.

Tubercular patients will be kept in the open air when weather will permit. Each patient will be instructed to use his own sputum cup, containing 25 c. c. of cresol, and under no circumstances to expectorate elsewhere.

The hospital apprentice in charge of the sterilizer will run it each day from 1 to 3 p. m.

All "heads" will be thoroughly cleansed each morning and kept in a cleanly condition at all times.

General field day on Friday.

Air bedding on Tuesdays, when possible.

Sputum cups will be collected each morning and burned.

The hospital apprentice in charge of diets will see that there is ice in the refrigerator and that the daily allowance of bread, butter, and milk is delivered.

All meals will be inspected as to quality and quantity and served immediately upon arrival in the isolation wards.

SICK OFFICERS' QUARTERS.

The sick officers' quarters have nine staterooms and a separate wardroom. They are under the direct supervision of the executive surgeon. A hospital apprentice, first class, and two hospital apprentices are detailed for duty in this ward. Special care is exercised in instructing them regarding serving of meals, care of officers' rooms, and other matters pertaining especially to treatment.

EYE, EAR, NOSE, AND THROAT DEPARTMENT.

All eye, ear, nose, and throat cases come under this department, which is in charge of a medical officer especially skilled in their treatment. The results obtained more than justify its establish-

ment, as many cases have been operated upon, as well as receiving special medical treatment. Cases are received from ships of the fleet for diagnosis, treatment, etc., without being regularly admitted.

The following are the general instructions:

All middle-ear cases, with or without complications, are to be watched; a pulse below 70, with a temperature of 100° or above, is to be reported to the officer of the day. A pulse below 60 is to be reported.

All treatments are given by the medical officer in charge, or by one of the hospital apprentices, drilled and instructed by him.

A careful record to be kept of all cases treated.

X-RAY ROOM.

The X-ray room, situated on the starboard side of the berth deck forward, is very well equipped, having in addition to the X-ray machine a high-frequency coil, galvanic and faradic batteries for special treatments.

A hospital steward is detailed to look after its equipment and upkeep.

In order to fix responsibility for breakage or improper use of the various electrical equipments of this room, no one except those detailed is allowed to use the apparatus of this room without obtaining permission from the executive surgeon.

Radiographs can be taken by the machine in less than 3 seconds. Medical officers of the fleet frequently send cases for diagnosis.

DENTAL DEPARTMENT.

This department is in charge of the dental surgeon, who has as his assistant a hospital steward qualified for this duty. Two rooms have been assigned for dental work, and when with the fleet both the dental surgeon and his assistant are kept exceedingly busy, and the number of cases to be treated has to be limited for each day. The work accomplished clearly demonstrates the necessity of its establishment.

THE HOSPITAL CORPS MESS HALL.

This room is situated below the sick officers' quarters, and is given over exclusively for the use of the Hospital Corps; not only for the serving of their meals, but also as a recreation hall. A piano, graphophone, mandolins and guitars, punching bags, etc., for their use have been obtained, and everything is done, consistently with the discipline of the ship, to make it as pleasant as possible, thereby adding to their contentment.

CONVALESCENT MESS HALL.

The convalescent mess hall, situated below the medical ward, is used not only for serving meals to convalescent patients, but as a recreation room in bad weather. Two strong rooms for the care of insane are located forward, and recently permanent folding bunks have been installed on both sides. The post office is also situated in the forward part of this compartment. In the after part of the compartment a room has been taken for the repair of linen. A hospital apprentice is detailed for this duty; and all hospital linen, when in need of repairing, is sent here, after being laundered, for repairs.

BAG ROOMS.

Two rooms, on either side of the ship, aft of the convalescent mess hall, are used for bag rooms, the starboard being for the Hospital Corps and the port for the patients. A card-index system is used and no confusion exists, as the bags and hammocks are sent direct to the bag rooms on admission of the patients on board the hospital ship. The bags and hammocks are tagged with the owner's name, rate, and ship, and when patients are able, bags and hammocks are scrubbed and the lower half of the tag removed, thereby designating this fact. When a patient is reported ready for duty a memorandum slip is sent by the pharmacist to the master at arms.

SHIP'S STORE.

The ship's store is under the direct supervision of the executive surgeon, who details a hospital steward, who is directly responsible to him for its general management. A complete inventory is taken every quarter by one of the medical officers, who certifies to its correctness, and this with a quarterly statement signed by the executive surgeon, and approved by the commanding officer, is sent to the paymaster having the accounts of the *Solace*.

The ship's store has proven a great source of convenience, not only to the entire crew, but to the patients as well.

DUTIES OF THE PHARMACIST.

The duties of the pharmacist aboard this vessel are different from those in a hospital in that they are in no way connected with the Commissary Department or the subsistence of patients; hospital corpsmen and auxiliary complement being under the direct supervision of the master, who has as his assistant a hospital steward detailed for that duty.

The duties of the pharmacist are principally clerical. Under the supervision of the executive surgeon he has charge of the record office, prepares or supervises the making out of all requisitions and public bills pertaining to the Medical Department, supervises the preparation of all bureau and fleet returns, and is responsible for the accuracy of all the returns pertaining to the ship's store. He also receives, distributes, and forwards all official mail, files all correspondence, and in an emergency acts as officer of the day.

He has detailed as his assistants one hospital steward and a hospital apprentice, first class. The personal equation is a big factor, and the excellent manner in which this duty is performed is a great credit to the officer having this detail.

DUTIES OF THE MASTER AT ARMS.

The master at arms is responsible to the executive surgeon for the discipline of the Hospital Corps and the cleanliness of the Medical Department.

7 a. m.—The master at arms starts on rounds and makes a careful observation of the night reports and day order books and ascertains whether all orders are being promptly carried out. He makes a careful inspection of wards, heads, wash and bath rooms, and the linen lockers to see that all are clean and in order for the inspection of the executive surgeon. He also receives the absentee reports from the hospital apprentices in charge of wards. Policing of bed patients is under his general supervision.

8.30 a. m. He reports to the executive surgeon and receives orders in regard to any change in routine or any hospital matters that are under his supervision. He reports the absence of any hospital corpsman from his regular duties, due to illness or any other cause, and receives reports from specially detailed hospital apprentices. At this time all official papers, together with books and slips requiring the signature of the medical officer in command, or the executive surgeon, are to be taken to the executive office.

9.15 a. m. All sewing, such as ward linen for mending or articles to be made for special use, must be ready at this hour for the hospital apprentice in charge of the linen-repair room.

10.30 a. m. Accompanies the executive surgeon on his daily inspection and makes full notes of repairs needed, etc.

2 p. m. The wards are again visited to make sure that everything is in orderly condition.

On Saturday morning the ward liquor books are looked over and compared with the amount issued from the dispensary. If the books are found correct, they are signed by the executive surgeon.

On Sunday the weekly detail is submitted to the executive surgeon for approval. On this day a list of the number of blankets and thermometers (with their numbers) in each ward is turned in to the executive surgeon's office.

THE COMMISSARY DEPARTMENT.

The Commissary Department of this vessel is under the direct management of the master, who has detailed as an assistant a hospital steward, who acts as commissary officer.

A weekly diet list is submitted for approval by the commanding officer, prepared by the commissary steward under the supervision of the executive surgeon.

A soft and liquid diet list of articles available is posted in each ward. The cost of subsistence averages 75 cents.

The Commissary Department should be under the charge of the pharmacist and the auxiliary crew fed in the same manner as civil employees at our naval hospitals. There is no doubt but that the subsistence could be reduced at least one-third if not one-half.

Although the officer of the day inspects all meals and the executive surgeon inspects the preparation, this method is unsatisfactory, and the entire galley should be under the direct orders of the commanding officer.

THE RULES AND RESPONSIBILITIES OF THE HOSPITAL CORPSMEN.

The hospital corpsmen shall regard their details as posts of duty from which they shall never be absent, except by permission from the proper authority.

Written reports, when practicable, will put the hospital apprentice in charge of wards in communication with the officer of the day or the ward medical officer.

When inspection is being made by the commanding officer, or the executive surgeon, the hospital apprentices in charge of wards shall accompany him.

Hospital apprentices in charge of wards when sent for by the officer of the day or ward medical officer shall be properly relieved by the senior apprentice.

Sick call is held at 8.45 a. m. and 7 p. m.

The hospital apprentices will observe the following hours:

6.30 a. m. Hospital apprentices report for duty.

7 a. m. First mess.

7.30 a. m. Breakfast; reporting back in ward for duty at 8 a. m.

11.30 a. m. First watch; dinner.

12 m. Dinner; reporting back at 12.40 p. m.

1 p. m. Hospital apprentices off watch; leave ward.

5 p. m. First watch; supper.

5.30 p. m. Supper.

9 p. m. The hospital apprentices on day duty relieved, and night apprentices report for duty.

It is considered that 30 minutes allows ample time for meals. If messes are late, or hospital apprentices are unavoidably detained, they are to inform the master at arms.

It is essential that the hospital apprentices be present at evening sick call.

Instructions from the executive surgeon are sent to the hospital apprentices through the master-at-arms.

The hospital apprentices are informed that details in regard to ward management are given them by the ward medical officer.

After sick call all reports regarding patients must be sent to the officer of the day to be transferred by him to the ward officers if he thinks necessary. Written reports to be sent if possible; otherwise verbal reports.

Money and valuables belonging to patients shall be transferred through the medical officers to the executive surgeon.

No food of any kind or fruit or candy is to be taken into ward without permission of the officer of the day or the ward medical officer.

The hospital apprentices in charge of wards will be notified when patients are to be confined in brig for punishment, or are to be restricted to ward.

All lights, except standing lights, shall be turned out in ward at 9 o'clock and reports regarding patients and absentees are to be made to the officer of the day.

Hospital apprentices in charge of wards are responsible for all keys. When leaving wards such responsibility shall be passed to the next senior apprentice of the ward, who is responsible during the absence of the hospital apprentice in charge for any irregularity that transpires.

The linen locker shall be kept locked.

Fresh linen is to be distributed only under the supervision of the hospital apprentice in charge of the ward.

When clean linen is brought to the wards on Friday it should be carefully counted and any discrepancy between that amount and the soiled linen previously turned in shall be reported in writing as early as possible to the executive surgeon.

All articles to be sterilized must be sent to the sterilizer between 1 p. m. and 3 p. m.

Wheeled chairs shall not be used unless ordered.

All occupied beds in wards shall have name of patient or occupant on chart board. A list of patients, with bed number, shall be kept.

Each patient in ward is to be supplied with a drinking glass having his name on the bottom, and which is to be kept clean.

Hospital apprentices off duty are not allowed in wards.

Hospital apprentices are to see that abandon-ship details are kept up to date.

Hospital apprentices or patients desiring special liberty must apply at the executive surgeon's office before 9 a. m.

Hospital apprentices must inform the hospital apprentice in charge of ward when requesting special liberty. Hospital apprentices are forbidden to play games with patients.

Any negligence or neglect in the performance of these duties shall be reported to the master at arms, which report shall be conveyed by him to the executive surgeon.

Any insubordination from patients in ward shall be immediately reported to the officer of the ward by the hospital apprentice.

Any insolence or impertinence towards a hospital apprentice in charge of a ward by a hospital apprentice or patient in the ward shall be immediately reported to the master at arms.

WEEKLY ROUTINE.

SUNDAY: Report the number of blankets on hand; thermometer report (giving numbers); ward detail.

MONDAY: Survey day; overhead pipes, ventilators, radiators, and bedside racks.

TUESDAY: Examine each bed for bugs and if any are found sterilize mattress and report at once. Draw general supplies; scrub beds and air bedding. Clean gear and apply kerosene to springs.

WEDNESDAY: Clean bulkheads, ports, and woodwork; inspect rubber goods.

THURSDAY: Inspect toilets, lights, and lockers; take extra clothing to the bag room; apply kerosene to nickel work; clean bright work.

FRIDAY: Field day and general overhauling for Saturday inspection; draw clean laundry; examine linen for mending.

SATURDAY: General inspection by commanding officer. Hand in liquor report for the week for approval.

The above, as the heading will show, is the weekly routine of this ship which has been in use here for over six months.

Systematic routine in everything has been the keynote.

To know what to do and when to do it saves lots of confusion and petty annoyances.

The following will serve to explain just what this weekly routine consists of:

On Sunday the hospital apprentice in charge of the ward makes a written report regarding total number of blankets on hand, as well as thermometers (with their numbers).

The ward detail list consists of the assignment of hospital corpsmen to their duties in their respective wards.

On Monday the hospital apprentice in charge of the ward, having set aside during the previous week articles on charge but unfit for use, sends them to the dispensary. These articles are accompanied by a written inventory, which is checked by the hospital steward in the dispensary.

In case of articles to be issued to replace those turned in for survey, the inventory slips are initialed by the hospital steward in charge of the dispensary. Both of the inventory slips are then sent to the executive surgeon's office. One slip is initialed and is an order for the reissue of those articles on the slip which were sent to the dispensary for survey.

In case of articles not to be reissued, the hospital steward in charge of the dispensary retains the original slip and makes a note in the property book. All articles for survey are sent to a room especially set aside for this purpose, and at the beginning of each quarter a survey is held.

It is readily seen that from the slips sent to the hospital steward for survey, a list can easily be made out. This system has worked admirably aboard this ship.

The note about bedside racks, pipes, ventilators, and radiators is simply a memorandum for the hospital apprentice in charge of the ward to pay particular attention to cleaning them on the day specified.

The entry for Tuesday is self-explanatory and by most careful attention this ship is kept comparatively free from vermin.

On Wednesday the toilets, lights, and lockers and bright and nickel work are given special attention.

The two other items are self-explanatory.

On Friday, which is a general field day, the laundry, which has been sent to the laundry, is reissued.

The hospital apprentice in charge of the ward, after careful examination to see that linen does not require mending, sees that it agrees with the inventory of soiled linen turned in. Any discrepancy is reported to the executive surgeon.

In case the linen is torn it is sent to the repair room.

On Saturday the entire hospital is inspected by the commanding officer and careful notes are taken by the executive surgeon during this inspection.

Each ward is provided with a special liquor book and slips are turned in to the executive surgeon's office for his inspection. These

slips show the amount on hand at last report, amount drawn, and amount expended during the past week. These are compared with the book in the dispensary and any discrepancy corrected.

Each ward is supplied with a treatment book.

A. SAMPLE PAGE FROM NIGHT BOOK.

Medical ward—January 1, 1914.

9 p. m. Reported for duty. Lights out and ward quiet. Absentees: A——— and B———.

9.15 p. m. Rounds made by supervising night apprentice.

9.30 p. m. Ward quiet.

10 p. m. Ward quiet. B——— returned at this hour.

10.45 p. m. C——— voided 200 c. c. of urine. D——— voided 175 c. c. of urine.

11 p. m. D——— restless. Other patients sleeping.

11.30 p. m. Relieved for mess.

12 m. Returned to ward. Ward quiet.

12.30 a. m. C——— voided 200 c. c. of urine. T–100.4°; P–90; R–24.

1.30 a. m. C——— awake and restless.

2 a. m. Ward quiet. All patients sleeping.

2.30 a. m. All patients resting quietly.

3 a. m. All patients sleeping.

4 a. m. All patients resting quietly.

4.30 a. m. C——— T–99°; P–90; R–24.

5 a. m. Ward quiet.

6 a. m. Called all hands. Secured specimens of urine from E——— and F———.

6.30 a. m. Absentees: A———. Relieved by day force.

B. SAMPLE PAGE FROM NIGHT REPORT BOOK OF SUPERVISING NIGHT APPRENTICE.

NIGHT REPORT—APRIL 2, 3, 1914.

9 p. m. Reported for duty. Received keys from hospital apprentices in charge of wards. Hospital apprentices mustered by master at arms, who reports all accounted for, lights out, and secure for the night. Hospital apprentices in charge of wards going off duty report to officer of the day, "all patients present or accounted for and wards secure for the night." Supervising night apprentice reports for duty.

10.30 p. m. Wards quiet.

11 p. m. Made rounds of ship; all quiet and secure.

11.30 p. m. Wards quiet.

12 m. Made rounds of ship; all quiet and secure.
12.30 a. m. Wards quiet.
1 a. m. Made rounds of ship; all quiet and secure.
1.30 a. m. Wards quiet.
2 a. m. Made rounds of ship; all quiet and secure.
2.30 a. m. Wards quiet.
3 a. m. Made rounds of ship; all quiet and secure.
3.30 a. m. Wards quiet.
4 a. m. Made rounds of ship; all quiet and secure.
4.30 a. m. Wards quiet.
5 a. m. Made rounds of ship; all quiet and secure.
5.30 a. m. Wards quiet.
6 a. m. Called Hospital Corps.
6.15 a. m. Called convalescent patients.

NOTE.—F———, C. E., G. M. 1, returned A.O.L. 22 hours.

7 a. m. G———, G. C., O. S., reported in his ward A.O.L. 15 hours.

Reported off duty and relieved.

C. INSTRUCTIONS FOR THE SUPERVISING NIGHT HOSPITAL APPRENTICE.

Report to the officer of the day at 9 p. m. and receive necessary keys from hospital apprentices in charge of wards.

Make rounds of ship and inspect brig every hour; at other times remain in vicinity of the officer of the day's office.

Keep a record of all men absent without leave and report any who may return to the officer of the day. Keep a record of all men returning from liberty.

Call all apprentices at 6 a. m. and, together with night apprentices, remain on duty until 6.30 a. m., or until relieved by the day apprentices.

Be careful to guard against fire, and in case of fire give the alarm and stand by to release prisoners.

See that apprentices on night duty are attentive to their patients, and report any infraction of discipline or neglect of duty.

Keep a written record of the above and turn in to the executive surgeon's office at 7.30 a. m.

RULES FOR ADMISSION, TRANSFER, OR DISCHARGE OF PATIENTS.

Bed patients must be given a bath, unless otherwise ordered, and a clean suit of pajamas, and shall have temperature, pulse, and respiration taken and same reported to the officer of the day.

Report to ward officer or officer of the day any unusual indication observed while bathing patient.

Ascertain, if possible, when last urine was voided and the last defecation. Send specimen of urine to laboratory, unless otherwise ordered.

Patients other than bed patients shall be directed to take bath on entering.

When patient is transferred from one ward to another a slip must be sent to receiving hospital apprentice with chart stating treatment, diet, etc. If no treatment, mention this on the slip.

Hospital apprentice in charge will see that pajama suit and slippers used by patient in hospital remain in ward when discharged to duty.

When patient is discharged, strip bed of linen. Pillow and mattress are to be sterilized if necessary. Bed frame and locker are to be thoroughly washed with soap and water. The bed is to be remade with clean linen.

RULES GOVERNING PATIENTS.

Liberty for patients in wards will be upon the recommendation of the ward medical officer.

Patients are not allowed to sit at or congregate about the ward desk.

Convalescent patients in ward may be called upon by hospital apprentice for light duty.

Patients who are on outside detail and congregate in ward are to do such work as may be assigned them by the hospital apprentice.

It is advisable that the convalescent patients remain out of the wards as much as possible.

All cleaners are to remain at their stations until after the executive surgeon's inspection.

Patients are not to smoke in toilets or in the wards.

Patients are not allowed to lie on beds without removing shoes and neatly turning down spread.

Patients must leave beds in neat condition.

Lockers must be kept in neat condition. They must be thoroughly overhauled and scrubbed every Thursday.

Convalescent patients must take off bedclothes every morning and turn mattress. Nothing must be stored under mattress.

Patients are not to use pajamas as underclothes.

Patients are to fold blankets neatly on beds.

Patients going to duty must wash and thoroughly clean locker.

Patients shall not be permitted to wash clothing in washbasins, or hang clothes in wards.

All patients must be present and wear uniform of the day for the Saturday morning inspection.

Patients confined in brig or absent with or without leave: Collect all clothing and belongings of same, make list and turn over to master at arms or hospital apprentice in charge of bagroom.

When patients are to be confined to brig they shall take their own locker contents to bagroom.

CARE OF BED PATIENTS.

Hospital apprentices in charge of wards are responsible for condition of bed patients.

They are required to inspect personally backs and mouths of bed patients night and morning.

Any indication of pressure sores must be immediately reported to the ward officer.

Mouths, finger nails, and toe nails of patients should be given special attention.

After operation bedside notes shall be continued for three days for each operative case, unless otherwise ordered by the ward medical officer.

Careful entries shall be made of urine and stools.

Amount of nourishment given during this time shall be recorded unless otherwise ordered.

For all patients having bedside notes a 24-hour summary shall be kept, to be in red ink, stating amount of water, nourishment and medication, highest and lowest temperature, amount of urine voided, and the number of bowel movements.

Bed patients shall have a bath every other day.

Bed linen to be changed on Fridays.

Report to ward officer or officer of the day if urine has not been voided within eight hours, unless otherwise ordered.

Specimens of urine, feces, sputum, etc., must be plainly marked with name of patient, rank or rate, name of ward, and name of ward officer.

Specimens of urine should not be less than 150 c. c., preferably the first urine voided in the morning.

Bottles for the collection of specimens to be obtained from the laboratory.

Specimens of feces should be about six grams, collected in small open-mouth bottles and properly sealed.

If possible, avoid sending bedpans to laboratory.

All specimens of sputum collected in sputum cups.

All specimens to be left in laboratory before 9 each morning.

OPERATIVE CASES.

Unless otherwise ordered, send specimen of urine to laboratory before and after operation.

Observe type directions in regard to preparation of operative cases, signed by medical officer in charge of ward.

Observe hour at which patient shall be sent to operating room.

Send slip with patient, stating time and amount of last urine passed.

If urine has not been voided within two hours of operation, unless otherwise ordered, patient is to be catheterized.

Hospital apprentices in charge of ward shall see that no foreign articles or valuables of any description are sent to operating room with patient.

MEDICINES.

Hospital apprentices in charge of wards are responsible for the administration of medicines, and must carefully instruct the hospital apprentices under them in administering same.

The hospital apprentice must report to hospital apprentice in charge of ward at once any patient who fails to stand by for his medicine, whereupon the hospital apprentice in charge shall report in writing to the officer of the day that such patient was absent from ward at medication hour.

All liquors, poisons, and narcotic drugs shall be carefully kept in a locked compartment.

All drugs shall be issued and all prescriptions filled by the hospital steward in charge of the dispensary.

Medicine glasses are to be kept in a disinfecting solution, which must be frequently changed.

The hospital apprentice when administering medicine must look at the label on the bottle before taking the bottle from the shelf; also before and after pouring.

All poisonous drugs must be labeled with red labels.

Labels are to be changed only by hospital steward in charge of dispensary.

DAILY WARD ROUTINE.

6 a. m. All apprentices called by supervising night apprentice.

6.15. a. m. Night apprentice calls all convalescent patients and sees that bed patients get their wash, teeth brushed, and hair combed.

6.30 a. m. Muster of hospital corpsmen on duty in wards by hospital apprentice in charge.

7 a. m. Inspection by master at arms to see that all apprentices are at their stations; special ward diets, breakfast for relief apprentices; one-half hour allowed.

7.30 a. m. Inspection of meals by the officer of the day.

8 a. m. Take temperatures, serve medicines, empty garbage cans, clean toilets, bathrooms, and lavatories.

8.40 a. m. Hospital apprentices and patients get into uniform for sick call at 9 a. m.

8.45 a. m. The hospital apprentice in charge of ward will accompany the medical officer holding sick call, and will have an order book in which he will write all treatment prescribed, and which will be initialed by the ward medical officer.

8.50 a. m. Attend to ice for wards and distilled water for coolers.

9.30 a. m. Draw ordered medicines and other articles. Absentee report. Sweep and swab decks, arrange lockers and chairs, and dust woodwork. Ward will be in readiness at 10.30 a. m. for inspection. Send special diet slip to the commissary steward. Dressings by ward medical officers.

10.30 a. m. Inspection of the ship by the executive surgeon.

11.30 a. m. Special ward diets; dinner for relief apprentices.

12 noon. Dinner.

1 p. m. Take temperatures and serve medicines; police ward.

4.30 p. m. Special ward diets; supper for relief apprentices.

5 p. m. Supper.

6 p. m. Sweep floors, take temperatures, serve medicines, have ward in orderly condition. Draw ice for coolers and ice boxes.

7 p. m. Sick call.

7.30 p. m. Draw medicines from dispensary.

8 p. m. Police wards.

9 p. m. Report to the officer of the day, "All patients accounted for," or, if any absentees, give their names, rates, etc. Turn out all standing lights. Turn over orders and keys to night hospital apprentice before going off duty.

Note.—Disinfect quiet room when necessary. No mess gear to be left in diet kitchen.

U. S. NAVAL MEDICAL SCHOOL LABORATORIES.

Additions to the pathological collection, United States Naval Medical School, July–October, 1914.

Accession No.	Tissue.	Diagnosis.	Collected by or received from.
1096	Blood	Filaria bancrofti	Passed Asst. Surg. G. B. Crow, New York Postgraduate Medical School Hospital.
1097	...do	Benign tertian, showing young schizonts and gametes.	Do.
1098	Liver (Spanish mackerel).	Abscess	Passed Asst. Surg. G. W. Shepard, U. S. S. Glacier.
1099	Blood	Pernicious anemia	Medical Director C. F. Stokes, U. S. Naval Hospital, Philadelphia, Pa.
1100	Gland smears	Bubonic plague	Passed Asst. Surg. H. Shaw, U. S. S. Prairie.

Additions to the helminthological collection, United States Naval Medical School, July–October, 1914.

Accession No.	Parasite.	Host.	Collected by or received from.
19900	Tænia saginata	Homo	Passed Asst. Surg. E. H. H. Old, U. S. Naval Hospital, Washington, D. C.

CLINICAL NOTES.

SUCCINIMID OF MERCURY IN PYORRHEA ALVEOLARIS—A PRELIMINARY REPORT.

By P. G. White, Acting Assistant Dental Surgeon, United States Navy.

No sane member of the medical or dental profession can rely upon cures in any or every pathological condition with an absolute certainty, nor can he promise that when a cure is brought about it will be permanent, for always a disease will again be reproduced when like conditions exist.

The chances of affording relief to the sufferer from pyorrhea alveolaris (too often given up in despair by the members of our profession) are, by this method of treatment, as promising and as positive as the relief and cure following the process of filling a majority of carious teeth.

It is not the writer's intention to discuss the various opinions held concerning the etiology of this prevalent disease, but in order that the purport of this report be understood the following stand is taken: That pyorrhea is due to a local irritation which may and often is prejudiced by general debility and a starved condition of tissues from lack of nutritive supply.

The use of succinimid of mercury in the treatment of this disease was first brought to the writer's attention, wholly by chance, at the Portsmouth Navy Yard. Two patients who had been under local treatment for pyorrhea presented themselves upon different days with gums swollen and exquisitely tender. Being unable to account for such conditions, which occurred at regular intervals, the patients were questioned, and the fact that they were also being treated for other troubles at the same time by Surg. B. L. Wright, United States Navy, senior surgeon at the yard, was brought to light. Investigation showed that the changes in the gum tissue and their hypersensitiveness were usually most pronounced on the second day after injection. The surprisingly quick cessation of the pus flow from the pockets and the corresponding return to normal of the gum tissue led to the introduction of succinimid of mercury in other cases by Dr. Wright and myself.

Some six cases have since been treated by this method and in every case a cure has been effected inside of four or five weeks. The dose

of mercury given at the first injection varied according to the physical condition of the patient, but usually averaged about 1 grain. For the purpose of tabulation, this was divided into fractional fifths, the first dose usually being sixth-fifths or five-fifths, and at each succeeding injection a reduction of one-fifth as the condition of the patient required. Injections were given at least once a week and local treatment continued every other day, the local treatment consisting of the thorough removal of calcareous deposits and the extraction of hopeless teeth and roots. Broken down tissue and sensitiveness of the necks of the teeth were reduced by a 10 per cent solution of silver nitrate and the patient was instructed to apply equal parts of aconite, iodine, and chloroform as a counter irritant and a stimulant to absorption.

At the completion of the treatment prophylatic advice as to the care and use of the teeth was given each patient, and it is hoped they will profit physically and mentally by the same.

A summary of the cases is given by Dr. Wright below:

Case 1: C——, E. W., chief carpenter. Came under observation May 4, 1914. Complaint: Severe pain, soreness and stiffness of shoulder joints, and of the feet and ankles. This condition had existed for some years; treatment at different times had proven of little benefit. For the past few months he had grown much worse, and was hardly able to get out of bed or dress himself. He was under treatment of Acting Assistant Dental Surg. P. G. White, United States Navy, for pyorrhea, and Dr. White considered it an extensive and bad case.

A diagnosis of chronic infectious arthritis was made, infection probably due to the condition of the gums. Injections of mercuric succinimid were given, as follows: May 4, gr. 7/5; slight gingivitis, feels better. May 11, gr. 5/5. May 19, gr. 4/5. May 23, entirely free from all symptoms. Dr. White reports pyorrhea cured. May 24, gr. 4/5. June 2, complains of pain in both hip joints, injection gr. 4/5. June 7, injection gr. 3/5. June 13, injection gr. 4/5. June 29, feels perfectly well, injection gr. 3/5. July 8, perfectly well: treatment discontinued. Patient states that a large patch of eczema which has been present on the chest for the past 30 years has also disappeared. There has been no return of pyorrhea or arthritis up to August 25, 1914.

Case 2: S——, W. H., sergeant, U. S. M. C. Case referred to me by Dr. White, with diagnosis of pyorrhea; gums soft, spongy, and retracted; pus exuding from around every tooth. He has a chronic arthritis of left ankle, which is considered an autogenous infection from the local infection of gums. Injections as follows: June 22, gr. 6/5. July 6, gr. 5/5; marked improvement. July 11, gr. 4/5.

July 17, gr. 4/5; all pain and swelling in left ankle have disappeared; gums normal. July 21, apparently cured.

The following injections were given as a precautionary measure: July 24, gr. 3/5. July 31, gr. 2/5. Up to date, August 26, he has remained apparently cured.

Case 3: R——, C. E., chief yeoman. Case referred to me by Dr. White, who has been treating the patient for about six weeks for an extensive and severe infection which has shown slight improvement. Injections of mercuric succinimid as follows: June 29, gr. 5/5. July 6, gr. 4/5. July 11, gr. 3/5. July 13, apparently cured. Three more injections were administered as a precautionary measure: July 17, gr. 3/5. July 24, gr. 2/5. July 31, gr. 2/5. Up to date, August 26, he has had no return of the infection.

Case 4: K——, E., prisoner. Referred by Dr. White. Patient presents soft spongy gums, which bleed freely, and are extremely tender and sensitive. Pus in large amount discharges from around every tooth. He has a polyarthritis, both knees and both ankle joints being infected. It is thought that this condition is probably an autoinfection. Injections of mercuric succinimid as follows: July 28, gr. 5/5; followed by marked improvement. August 3, gr. 4/5. By August 6, all symptoms had disappeared. August 18, no evidence of pyorrhea present, but injections resumed as precautionary measure, gr. 4/5. August 24, gr. 4/5; pyorrhea and arthritis cured.

Case 5: M——, J. J., P. M. Referred by Dr. White. Extensive and severe pyorrhea. Injections of mercuric succinimid as follows: August 18, gr. 5/5; marked improvement followed immediately. August 24, gr. 4/5. August 26, pus has entirely disappeared from around all the teeth, with the exception of the last two lower left molars, from around which a small amount of pus can be pressed.

Case 6: D——, A. W., prisoner. Referred to Dr. White by Passed Asst. Surg. Wheeler, United States Navy, for local treatment of a severe and extensive pyorrhea on August 19. Dr. Wheeler had, on August 18, injected gr. 6/5 of mercuric succinimid; the patient also having a gonorrheal arthritis. August 19, gr. 5/5. Gingivitis followed. August 26, gums still slightly tender, but pus has entirely disappeared.

While the cases have been few, the results have been far beyond expectations, and much is hoped for in its future use in pyorrhea.

A CASE OF PITYRIASIS ROSEA.

By R. E. Ledbetter, Surgeon, United States Navy.

Hyde and Montgomery define this disease as "a mild febrile disorder of specific character and determinate course, in which appears

a cutaneous, usually symmetrically disposed exanthem in the form of multiple, circumscribed, superficial, roundish or oval-shaped yellowish and rosy patches, covered with fine scales and seated for the most part on the trunk." They also state that at times there is a general adenopathy with slight fever, and that occasionally the eruption so closely resembles a maculopapular syphilide, as to defy even an expert.

In view of these facts, the following case of pityriasis rosea is deemed of sufficient interest to report as the condition is rare in the Navy and this particular case so closely resembled syphilis that the deciding factor in making the diagnosis was the Wassermann reaction.

W. R. S., private, U. S. M. C., was admitted to the U. S. Naval Hospital, Washington, D. C., on January 22, 1914, with diagnosis undetermined, though syphilis was suspected. There was general malaise, and a temperature of 99.2. Physical examination showed slight pharyngitis, a copper-colored rash on the body, general adenopathy, and a discharge from the penis positive for gonococci. Patient denied specific infection, but from the symptoms presented it was considered that there was possibly an urethral chancre with the usual secondary manifestations of lues. Patient was placed under observation pending a Wassermann. Next morning the rash had assumed a maculopapular form which was typical of secondary syphilis, and the adenitis had increased, being most marked in the right inguinal region, which is well shown in one of the accompanying photographs. The eruption was most apparent on the trunk, though there were spots on the arms and upper thighs anteriorly and on the legs. As can be seen in the photograph, the buttocks and thighs posteriorly were practically free from the eruption.

The Wassermann was awaited with interest and was reported as negative. On the fourth day there was some scaling and slight fading of the eruption and the adenitis was not so marked. The temperature fell to normal and the pharyngitis cleared up. Owing to the negative Wassermann and the scaling, a diagnosis of pityriasis rosea was finally made, though as a check another Wassermann was made a week later, which was negative. As this disease is self-limited no special treatment was ordered, though local applications of dilute acetic acid followed by 10 per cent sodium hyposulphite solution were occasionally applied.

The eruption disappeared in about 10 days, as did the adenitis and the patient was discharged to duty as well. The Wassermann was negative.

The points of special interest in this case are the marked resemblance of the eruption to a maculopapular syphilide, the general adenitis, and the possibility of an urethral chancre.

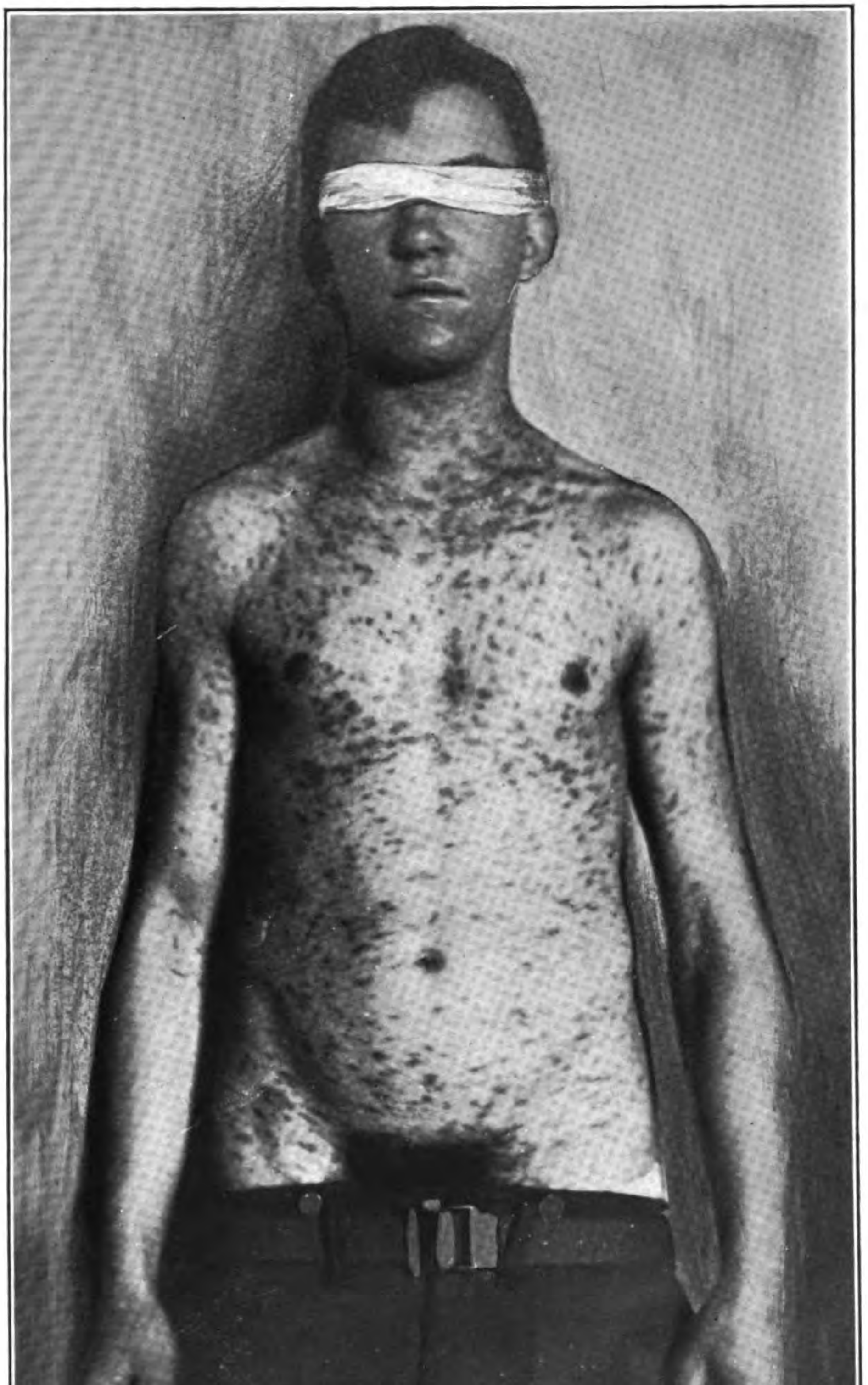


FIG. 1.—PITYRIASIS ROSEA, SHOWING RASH CLOSELY RESEMBLING A MACULOPAPULAR SYPHILID.

Note adenitis in right groin.

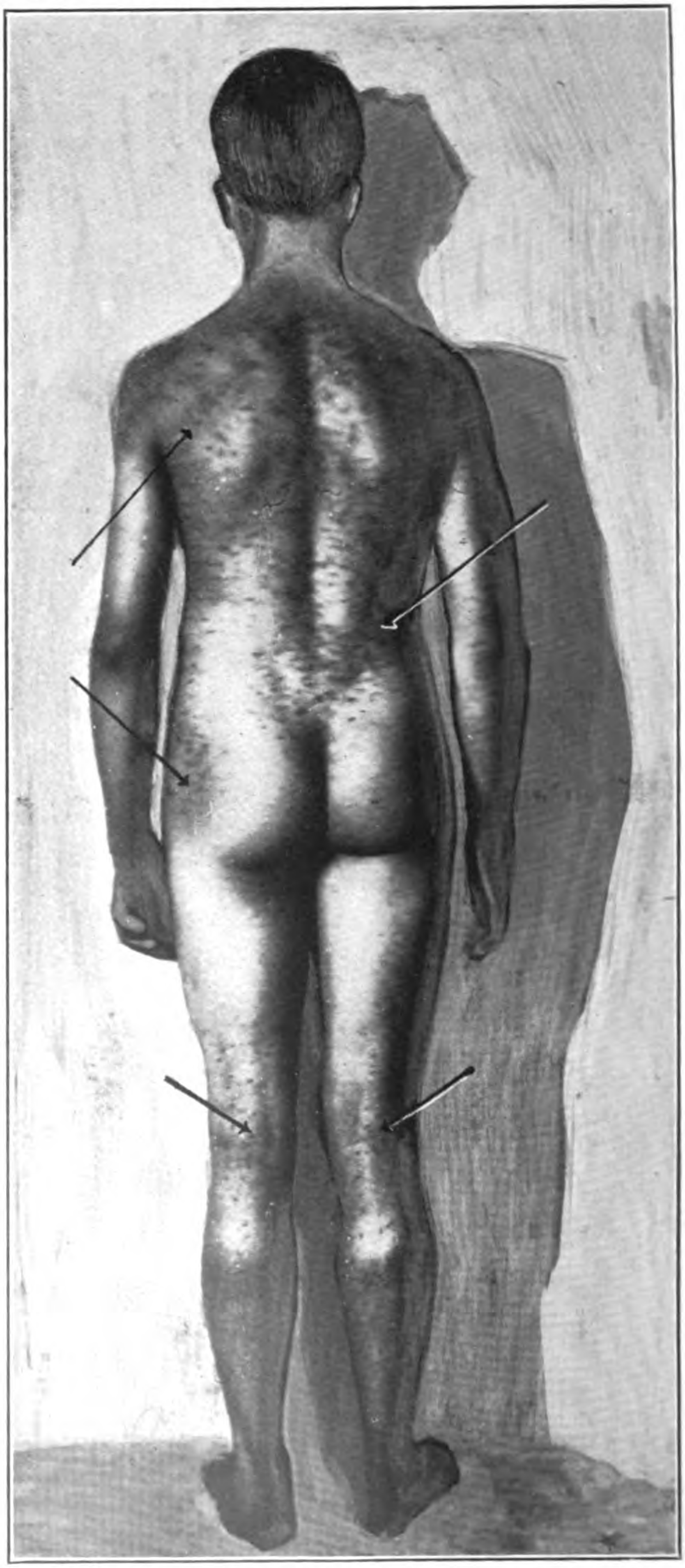
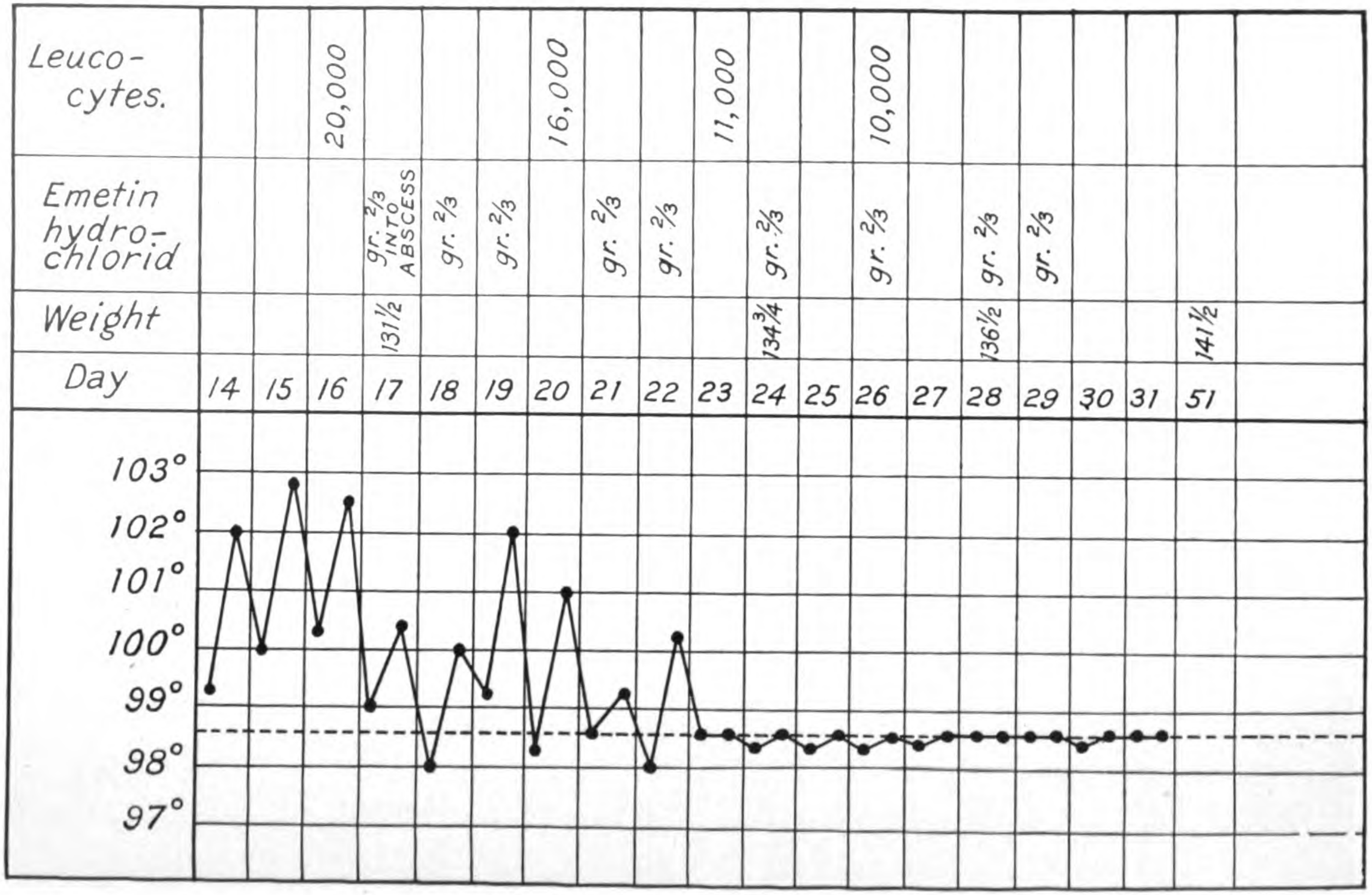


FIG. 2.—PITYRIASIS ROSEA, SHOWING RASH ON BACK AND LEGS.

Note absence of spots on buttocks and thighs.



AMEBIC ABSCESS TREATED WITH EMETIN.

In the absence of the facilities for obtaining a Wassermann reaction, it is probable that this patient would have been pronounced a syphilitic and treated accordingly.

I am indebted to Medical Inspector Stitt, U. S. Navy, and Passed Assistant Surgeon Clark, U. S. Navy, for their kindly interest in the case and to Hospital Apprentice (first class) Avery for the excellent photographs taken by him.

EMETIN IN THE TREATMENT OF AMEBIC ABSCESS OF THE LIVER.

By H. F. STRINE, Surgeon, and L. SHELDON, jr., Passed Assistant Surgeon, United States Navy.

Our personal experience with emetin in treating amebic infection is limited to the one case here reported, which appears to us of special interest at the present time as bearing on the value of emetin and the liability to relapse when its administration has been discontinued. This case is in accord with the general belief that emetin is directly destructive to free amebas in the tissues of the body, but has no effect on the encysted form. It also brings up the important point, from a military consideration, of the danger of postdysentery cases as carriers of the *Entameba histolytica.*

J. B., coal passer, U. S. Navy, contracted dysentery in New Orleans, La., in October, 1913. He states that he was treated in the Charity Hospital for about six weeks; that ameba was demonstrated in his stool and that he was treated by injections of emetin (gr. ½) t. i. d. during his stay in the hospital. He enlisted in the United States Navy in May, 1914, having regained his normal weight and apparently in excellent health. July 9, 1914, he was admitted as a patient to the hospital ship *Solace*, with a history of illness beginning about two weeks before with pain in the right shoulder, an irregular fever, rapid loss of weight (22½ pounds), and night sweats. There has been no return of intestinal symptoms since leaving the hospital in October. Blood examination showed a leucocytosis of 20,000. Feces negative for ameba. Right lobe of liver enlarged on physical and roentgen examination. July 12, an abscess of the liver was located with an aspirating needle passed through the tenth intercostal space. About 200 c. c. of pus were withdrawn and emetin (gr. ⅔) dissolved in saline solution injected into the abscess cavity. No effort was made to empty the cavity by aspiration. Ameba could not be demonstrated in the liver pus. At the present time, August 15 (fifty-first day), weight 141½ pounds, temperature continuing normal, and emetin (gr. ⅔) subcutaneously administered every other day. The appended chart shows the continued treatment and rapid convalescence.

SALVARSAN IN A CASE OF AMEBIC DYSENTERY.

By O. J. MINK, Passed Assistant Surgeon, United States Navy.

The patient contracted dysentery in Nicaragua in September, 1912. Since that time he has received all of the usual treatments for dysen-

tery, including appendicostomy. At times he improved sufficiently to be able to return to duty for a few months, although not entirely free from symptoms. During the past three months the amebas in the stools have been active and numerous even during vigorous treatment with ipecac, emetin, and quinin irrigations.

On July 9, 1914, he was given 0.6 gram of salvarsan intravenously, and on July 18 passed the first solid stool in five months. The stools have continued solid, and at the present time contain no amebas after vigorous saline catharsis.

While there is as yet no reason to consider the improved condition as permanent, the improvement was so rapid and marked that the case is considered of interest.

LACERATION OF THE SUBCLAVIAN ARTERY AND COMPLETE SEVERING OF BRACHIAL PLEXUS.

By H. C. Curl, Surgeon, and C. B. Camerer, Passed Assistant Surgeon, United States Navy.

G. B. L., male, age 33, fell 25 feet, striking on the edge of a steel plate. The full force was received on the right shoulder at the base of the neck. He was seen by the yard surgeon in a few minutes, when a large and rapidly increasing swelling was found at the base of the neck. There was no pulsation in the brachial artery and no sensation in arm or forearm. Shock was well marked. The patient was immediately transferred to the hospital and operated upon at once. Under ether the classical incision for ligation of the third portion of the subclavian artery was made, and on going through the deep fascia there was a spurt of blood under great pressure. The finger, compressing the subclavian artery against the rib, controlled hemorrhage, and with some difficulty the artery was ligated. After cleaning out the wound an extensive area of laceration was discovered extending back to the scapula, while the brachial plexus was found to be entirely cut where it crossed the first rib.

The cords of the plexus were extensively lacerated and lying in a mass of débris. The transverse cervical and suprascapular arteries were crushed. As the man was practically pulseless, the wound was dressed, with drainage, and he was returned to the recovery room. He rallied nicely, but on the fourth day it became necessary to amputate the arm at the deltoid insertion because of lack of circulation. The amputation was done painlessly, without anesthetic, and absolutely no evidences of shock were observed. The hemorrhage was, of course, very slight and easily controlled. Recovery was uneventful.

The points of unusual interest were (*a*) the laceration of the subclavian artery and complete severing of the brachial plexus without fracture of the clavicle or first rib and with unbroken skin; (*b*) the painless amputation of the arm near the shoulder without anesthetic and with absence of any appreciable shock due to the cutting of the brachial plexus.

MALARIAL INFECTION COMPLICATING SPLENECTOMY.

By H. F. STRINE, Surgeon, United States Navy.

This patient was presented before the surgical section of the Norfolk County Medical Society at a meeting in December, 1913, when the following paper was read:

C———, age 22, while in training at Piney Beach, Va., during the latter part of August, 1913, states that he had several chills with fever and was given quinin for about five days.

He was scheduled to box in the final contest of a smoker at the St. Helena Training Station September 27. In the first round he received a blow on the left side and dropped to the mat. A foul was not allowed and he continued the fight until the fifth round, when the decision was declared against him. About 20 hours later he was admitted to the hospital, pulse 120, respiration 38, and signs of severe internal hemorrhage; the urine withdrawn by catheter was free from blood. A contused area was noticed above the left anterior-superior spine of the ileum.

Under ether anesthesia the peritoneal cavity was opened by a high left through-rectus incision modified to deliver an enlarged transversely ruptured spleen. Splenectomy was performed and the peritoneal cavity freed from an enormous quantity of blood. The wound was then closed without drainage. The spleen was about three times its normal size. For 36 hours his temperature continued subnormal, then gradually, without a chill, rose to 104°. His condition was alarming, he being extremely anemic and semiconscious.

Blood examination showed numerous malarial organisms, segmenting and ring forms. No crescents were observed at this time; however, the examination was hasty and no special interest taken in the character of the infection present. The case plainly required vigorous antimalarial treatment. Quinin hydrochlorate (gr. 35) was administered and later an intravenous injection of neosalvarsan (gm. 0.6). Twenty-four hours later blood specimens showed an enormous number of crescents, three to one white blood cell. No other form of malarial organism was observed.

From the third day on the patient's temperature remained practically normal, convalescence being rapid and uneventful. Quinin

was discontinued after the first week. A second injection of neosalvarsan was given during the second week. The crescents persisted in the circulation apparently undiminished, although as the cellular elements of the blood increased from day to day the slides were less spectacular. Thirty days after the operation, upon the suggestion of Dr. Hancock, quinin hydrochlorate (gr. 10) was given daily. This has been continued until the present time.

The crescents gradually diminished and disappeared on the fifty-fourth day. This case, as it appears to me, presents two interesting features:

First. Convalescence apparently was uninfluenced by splenectomy. The differential leucocyte count was practically normal throughout. The hemoglobin percentage on the seventh day was 35–40; at present it is 90. His normal maximum weight has been 140 pounds; he weighed in before the fight at 138; his present weight is 145 pounds—a gain of 15 pounds since the sixteenth day after the operation.

Second. What was the reason for the sudden outpouring of crescents on the third day? Were they, lodged in the bone marrow and elsewhere, drawn into the circulation by the rapid cellular extrusion that must follow severe loss of blood and splenectomy after shock and reaction had passed away, or did the ruptured spleen liberate the crescents? In the latter case they could not have been overlooked in the specimen examined on the second day. Did the 10-grain daily dose of quinin destroy the crescents; or are many of them simply screened off again by the bone marrow and still present in his body? I shall appreciate having comment on the case.

Note.—This patient was discharged to duty early in December, 1913. In June, 1914, he visited the *Solace* at the New York Navy Yard, where he was serving on a tug. He stated that he had been in excellent health until recently when chills and fever had returned. A blood examination showed tertian malarial organisms but no crescents; a second infection.

A CASE OF GASTRIC HEMORRHAGE—OPERATIVE INTERFERENCE IMPOSSIBLE.

By G. E. Robertson, Passed Assistant Surgeon, United States Navy.

C. H., C. B. M.; born in Sweden, age 39 years, was admitted to the U. S. Naval Hospital, Philadelphia, Pa., March 3, 1914, with acute gastric catarrh. The man's history previous to the present attack was negative except that he had been excessively addicted to the use of alcohol.

At the time of admission he complained of pain in the epigastrium at the tip of the ensiform cartilage and in the back at the level of the twelfth dorsal vertebra.

There was a history of his having vomited twice on board ship, but he did not vomit at the hospital until 10 days after admission. Examination of his stools failed to show any blood. Temperature, pulse, and respiration were normal. He was given sodium bicarbonate, liquid diet, and a cathartic when necessary. During the 10 days, March 3–13, his condition apparently improved; he neither complained of pain nor exhibited any symptoms of gastric disturbance.

At 9 a. m. of the 13th he passed blood by rectum. At 11.30 a. m. he collapsed; skin was cold and clammy and he became almost pulseless. He exhibited signs of air hunger. At this time he passed a small quantity of blood by mouth. He was stimulated, and in the course of an hour reacted.

At this time the advisability of operating for gastric ulcer was seriously considered by the staff. It was decided that the man's weakened condition precluded any operative interference. He was treated expectantly with the hope of improving his condition to such an extent that an operation could be undertaken with reasonable hope of his withstanding the shock. The foot of the bed was raised, proctoclysis started and morphin given. Nothing was allowed by mouth and the patient was kept absolutely quiet. His condition gradually improved during the afternoon. He occasionally expectorated small quantities of blood, but otherwise showed no signs of hemorrhage.

At 4.15 a. m., March 14, 17 hours after his first gastric hemorrhage, his pulse suddenly became weak most immediately he began vomiting blood in great quantities—2 quarts in 5 minutes. Ten minutes after collapse started he had passed away.

Autopsy: The stomach was full of blood—2 quarts. The small intestines contained a moderate amount of blood. The greater and lesser omentum were infiltrated with blood. On the posterior wall of the stomach, 1 inch from the esophageal orifice, was an ulcer 2 cm. in diameter. Running across this ulcer was a small artery which was eroded and was the cause of his hemorrhage. Other than the above the findings were negative.

OPERATION FOR STRANGULATED HERNIA; REPORT OF CASE.

By W. S. PUGH, Passed Assistant Surgeon, United States Navy.

On May 28, 1914, the Alaska steamship *Dora* arrived at Dutch Harbor, Alaska. The chief engineer of the *Dora* was brought aboard the *Buffalo* suffering from a strangulated right inguinal hernia of 10 hours' duration. The patient was a man 55 years of age, who, in addition to his local lesion, was suffering from an old asthma and

arterial sclerosis. He had been operated upon for hernia about six years before; but it recurred after two years as a result of his asthmatic condition.

Examination revealed a very large mass over the right inguinal region, extending into the scrotum; symptoms of intestinal obstruction were marked. Attempts were made at reduction by gentle taxis without success. Patient was then anesthetized, and even under anesthesia reduction was found impossible, so operation was resorted to.

Operation: An incision about 5 inches long was made over the protruding mass in the inguinal canal. When the canal was opened a mass of black, apparently lifeless, gut about 15 inches long was found. The constriction at the internal ring was very tight and great care had to be exercised in incising it to avoid further damage to the gut. The condition of the gut looked hopeless; but after very hot saline compresses were applied to it for about 20 minutes it began to clear and was replaced in the abdominal cavity. After the gut had been reduced and an old sac removed, the canal was closed as for radical cure of hernia, with a rectus transplantation. Chromic gut sutures were employed. The skin was closed with silkworm gut, and a small drain of rubber tubing left in lower angle of wound. Drain was removed on the second day and wound found dry.

On June 5 the wound was found entirely healed and all sutures were removed. The abdominal wound appeared to be in good condition. The patient is now convalescent and is being kept at rest until he can be returned to his home. Aside from the annoyance caused by the asthmatic condition his recovery has been uneventful.

A CASE OF BRONCHIECTASIS WITH HYPERTROPHIC PULMONARY OSTEOARTHROPATHY.

By L. C. WHITESIDE, Passed Assistant Surgeon, United States Navy.

The following case was treated at the U. S. Naval Hospital, Mare Island, Cal., in the year 1913:

G. W. U., P. M., was born on a farm in Sheffield, Ohio, September 27, 1874. He began school at 6 years of age and continued until 15 years old. From that time until 27 years of age he worked at various manual labors and then enlisted in the Marine Corps. He had the ordinary diseases of childhood, but was otherwise in perfect health. No venereal history. At the age of 26 he was kicked in the chest by a horse, a fractured rib resulting, from which a slight deformity remains over the sixth rib, right side.

His parents were of Scotch descent. His mother died from an unknown cause at the age of 42; his father is living and in good

health, a farmer by occupation. One sister died from typhoid pneumonia, otherwise the family history was negative as to lung diseases. The uncles on his mother's side were about 6 feet tall and in good health. There is no history of tumor in family.

The patient enlisted at Cleveland, Ohio, in December, 1901, and shortly afterwards was sent to Guam, at which place he was stationed for one year and nine months. From there he went to the Philippine Islands, at which place he contracted dengue. After a short illness he was sent to Mare Island, and from there to Alaska, staying at the latter place for about one year. Returning to Mare Island, he was stationed at the marine barracks for about one year, during which time he contracted mumps with no complications. Returning to Guam in 1906, he was stationed there until 1912. His health record shows a note under date of July 24, 1912: "Blood examination negative; stools negative for intestinal parasites." Under date of November 3, 1912, there is an admission to the sick list with "Ancylostomiasis. Stools showed hook and whip worm ova." These entries were made at the U. S. Naval Hospital, Guam.

Leaving Guam in December, 1912, en route home, he was detained in Philippines for six weeks. While stationed in Guam he married a native woman. No children were born. While on the transport coming home from the Philippines he states he caught could about February 6, 1913. Treatment seemed of no avail, and he arrived in the United States March 1, 1912, with a very severe cold in chest. Patient states he lost 30 pounds on the trip, his ordinary weight being about 200 pounds. This is substantiated by photographs taken while in Guam.

The following is taken from his health record:

"Marine Barracks, Mare Island, Cal. Admitted March 2, 1913. Bronchitis, acute. Origin, duty, exposure aboard transport. States he contracted a severe cold February 6, 1913. Temperature 100° F. Very severe cough with profuse expectoration, very offensive odor. Sputum examination negative for T. B. White count 30,000. Differential count normal except 4 per cent eosinophilia. Stools show very many hook and whip worm eggs. Discharged and admitted March 14, 1913. Uncinariasis. Given thymol 1.3 grams every two hours for three doses. Cough very much better. Urinalysis negative. Thymol given about every two weeks. Cough remains same, slight temperature persists. Transferred to hospital.

"Readmitted. U. S. Naval Hospital, Mare Island, Cal., April 28, 1913. Uncinariasis. Same condition found.

"May 19, 1913. Temperature normal, patient up, persistent cough, sputum very foul. No T. B. Stools negative for hookworm ova. Urine examination negative.

"May 28, 1913. Cough worse. Mucopurulent expectoration, very foul, breath offensive. Given urotropin gr. 10 and quinin gr. 10 every four hours. Urin examination negative."

At this time it was noticed that his hands and feet were slightly swollen when sitting up, the swelling disappearing when he was lying down, being normal upon arising in the morning.

"June 10, 1913. Same. Running evening temperature, 101°; morning temperature, 99.2°. Pulse, 110. White count, 16,600, differential count normal except an eosinophilia 4.5 per cent.

"June 18, 1913. Temperature, 100.6°. Sputum negative for T. B., very offensive odor, very many white cells.

"June 26, 1913. Hookworm eggs found in feces. Thymol given.

"June 30, 1913. Temperature, 100.6°. Blood negative for malaria.

"July 5, 1913. Temperature, 100.4°. Patient states this evening that he coughed up a large mouthful of very offensive pus-like mucus that had a very bad taste. This was coughed up with very little effort, 'seemed to just run out of my lungs.'

"July 9, 1913. Cough less; patient expectorating about 100 c. c. a day. Expectoration not so foul or purulent."

Sputum examinations were made daily and hookworm ova considered when examining. On standing, the sputum would separate into three layers. It was of greenish color. No blood was found. Few pneumococci, staphylococci, and other bacteria were present, but many pus cells.

"July 30, 1913. Cough and expectoration about same, latter of foul odor. White count, 14,800. Differential count normal, 2.5 per cent eosinophilia. Noguchi test negative. Von Pirquet test negative.

"August 4, 1913. Diagnosis changed to bronchiectasis. Inhalations of compound tincture of benzoin b. i. d., urotropin and quinin continued. Thymol given about every three weeks when patient is able to stand it.

"August 13, 1913. Urin examination: Faint trace of albumin, few epithelial casts, small granular casts, many renal cells, and many leukocytes.

"September 9, 1913. Temperature normal. Very few hookworm eggs in feces. Cough and expectoration slight, no odor. From this time on the patient grew gradually worse, his hands, feet, and knees swelling a little day by day and not becoming normal on lying down, the same size morning and evening. Temperature still remained about 101°.

"November 11, 1913. Urine examination: Specific gravity, 1.021; trace albumin; very few hyaline casts, cylindroids, leukocytes, squamous epithelial cells."

FIG. 5.

FIG. 6.

From these later urine examinations it will be seen that the albumin and casts showed a slight irritation of the kidneys, due to the prolonged presence of pus in the lungs

On December 29, 1913, this patient was discharged from the U. S. Naval Hospital at his own request, as his enlistment had expired and he was very anxious to go back to Guam. On December 28 the following measurements were taken:

Height, 67¾ inches; weight, 140 pounds; fingers (circumference over first phalanges), 3¼ inches; wrists (circumference), 8¼ inches; elbows (circumference), 9½ inches; knees (circumference), 16 inches; ankles (circumference), 12½ inches.

The photographs and roentgenograms were made December 28, 1913.

Figure 1 shows the swollen parts compared to the unaffected parts of the limbs. The swelling will be seen to be symmetrical. The loss of weight can be judged from the appearance in general.

In figure 2 the large nose is the prominent feature. The patient states that he always has had a rather prominent nose, but from observation it is thought to have slightly increased in size. Otherwise, the features show nothing abnormal when the normal weight of the man in health is considered.

In figure 3 the comparison of the size of the fingers and wrist with the rest of the arm is marked. As before set forth, the measurements will give a more accurate idea of the relative difference of these parts. The fingers also will be seen to be more sausage shaped and not clubbed. This differs from the other reported cases of osteoarthropathy in this respect. The nails are curved, as described by articles on this subject.

In figure 4 will be seen the size of the knees and ankles, particularly the latter This swelling of the ankles was not an edema, there being no pitting on pressure. The scar on the leg is unaccounted for, but may be the site of the original hookworm infection. The skin over the swollen parts was rather tense, but at no time were the tissues edematous.

The roentgenograms show the bony deposit in the affected parts.

Figure 5 was made September 14, 1913, and shows the beginning deposit of bone on the radius, the ulna, the metacarpal bones, and the proximal phalanges.

Figure 6 was made December 28, 1913, and shows the bony deposit on the bones of the forearm, the carpal and metacarpal bones, and the first and second rows of phalanges. As will be seen, the third row of the phalanges is free from deposit, accounting for the absence of the clubbing already spoken of.

A plate of the left knee was made on the 28th of December, but is not very clear. The outer tuberosity is slightly enlarged, al-

though the shadow is light. Above, running along the external border of the shaft of the femur, from the upper portion of the external condyle, is seen the deposit of bone in that region.

Figure 7, made on December 28, 1913, shows clearly the deposit of bone about the lower extremity of the legs. On the fibula the laminated appearance of the deposit is marked. The involvement of the interosseous membrane is also seen.

In coming to a conclusion as to the exact nature of the disability in this case it was necessary to eliminate several other conditions.

1. Disease of the kidney was easily disposed of by the symptoms and laboratory findings as given.

2. Myxedema was eliminated also by studying the clinical symptoms. In this case there was no increase in the general bulk of the body, no subcutaneous swelling of the parts of the body affected in myxedema, no slowness of speech, no mental dullness; the hands were not spadelike, the temperature not subnormal. As against these we have the symptoms and signs as previously set forth.

3. Acromegaly has been duly considered, but the following points will show why this diagnosis was eliminated. The family history in this case was negative. While this man was of medium height and good weight prior to his illness, we have none of the facial changes, with the exception of the rather prominent nose, found in acromegaly, such as prominent and arched brows, elongation and enlargement of the face due to the increase in size of the inferior and superior maxillary bones, no marked protrusion of the lower jaw, no separation of the teeth from alveolar involvement, no marked enlargement of the ears; also no change in the cranium. While the nose in this case was slightly enlarged, it will be remembered that some enlargement of the nose has been mentioned in connection with pulmonary osteo-arthropathy. Acromegaly also is a slow, insidious disease, extending over a considerable period of time, whereas this man's condition developed in a few months. There were no eye changes in this case. We have no history of enlargement of the bones prior to the onset of the present illness. There was no thickening of the lips as seen in acromegaly. Lastly, the condition of the bones developed as a complication of the bronchiectasis, and was noted as beginning about two months after the onset of the lung condition.

In summing up this case there appear to be several interesting points that are deemed worth noting: The clubbing of the fingers in the pulmonary osteo-arthropathies, given so much weight by Marie and others, was entirely absent in this case. The fingers were spindle and sausage shaped, the greatest enlargement being over the first phalanges. The nails, however, were curved longitudinally and

transversely. As the heart in this case was perfectly normal, it may be that the good compensation would account for the lack of clubbeing of the fingers, since this condition is due to a tissue increase at the finger tips and not to a bony formation on the terminal phalanges.

It is interesting to note the complication of uncinariasis in this case. Whether the bronchiectasis was originally caused by the presence of hookworm embryos in the bronchial passage, as was at first suspected, or just the result of a prolonged attack of bronchitis, was finally decided after the extended microscopical examinations of the sputum failed to show any of the embryos. However, there still remains ground for speculation in regard to the causative agent. The hookworm infection is thought at least to have greatly augmented the subsequent bony growth, in that it caused a marked lowering of the patient's *vis vitalis*.

The length of time elapsing between the onset of the simple bronchitis, about February 6, 1913, according to the patient's statement, and the development of the bronchiectasis, about July 5, 1913, is considered worth noting. This rapid development would seem to bear out the idea of hookworm embryo infection. Then, again, the onset of the osteo-arthropathy so soon after the development of the bronchiectasis is most unusual. The swelling of the hands and feet became permanent about the middle of September, 1913, about two and a half months after the lung condition became evident. The literature on this subject cites cases of bone involvment many years after the inception of bronchiectasis or other lung condition. In this case the bone development was a question of only a few months. The chest examination of the patient showed nothing but the physical signs of bronchiectasis.

It is interesting to compare the two roentgenograms of the left hand taken at different times. The one made in September shows a beginning bony formation on the arm and hand bones, but when compared with the roentgenograms made in December, just three and a half months afterwards, the remarkable increase in the bony growth is very evident.

61713—14——9

EDITORIAL COMMENT.

SYSTEMATIC RECORDING AND TREATMENT OF SYPHILIS.

Recent advances in diagnosis and treatment of syphilis give increased importance to systematic treatment of the disease. Systematic record of such treatment is of value in relation to the statistics of the disease as well as to the welfare of the patient. The article on this subject by Surg. Fauntleroy and Passed Asst. Surg. Old, and that by Passed Asst. Surg. Cottle, contain some excellent suggestions as to methods of procedure in these cases. The bureau will be glad to be informed of the ideas of medical officers on this subject.

The form now in use by the Army is given below.

(PAGE 1.)

FORM 78.

MEDICAL DEPARTMENT, U. S. A.

(REVISED NOV. 24, 1913.)

SYPHILITIC REGISTER.

In the case of

(Surname.) (Given name.)

(Rank.) (Co.) (Regiment or Staff Corps.)

BIRTH.

Date --

Race --

DATES OF ENLISTMENT.

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FINAL DISPOSITION OF CASE.

Cured --

Discharged on account of----------------------

Deserted--------------------------------------

Died --

TRANSMITTAL OF REGISTER TO SURGEON GENERAL.

Date --

Station--------------------------------------

Signature------------------------------------

DATE WHEN AND POST WHERE DIAGNOSIS WAS MADE.

DATE WHEN AND PLACE WHERE INFECTION WAS CONTRACTED.

DATE AND LOCATION OF PRIMARY LESION.

DATES AND NATURE OF SECONDARY LESIONS.

DATES AND NATURE OF TERTIARY LESIONS.

(Page 3.)

SERUM REACTIONS

Date.	Result.	Where made.	Date.	Result.	Where made.

(Pages 4, 5, 6, and 7.)

TREATMENT.

Place.	Date.	Drugs and method of administration.	Signature of medical officer.

(Pages 8, 9, and 10.)

PROGRESS OF CASE.

Station.	Date of arrival.	Date of transfer.	Destination.

(Page 11.)

(PAGE 12.)

INSTRUCTIONS.

1. This register will be kept in the case of every soldier, and of every general prisoner, who has syphilis. It will be begun at the first station where the diagnosis is made, and will be continued until the patient is cured or permanently leaves the service.

2. A case is considered cured when the following conditions have been fulfilled:

(*a*) No treatment for one year during which there have been no symptoms, no positive Wassermann reactions and several negative ones.

(*b*) At the end of the year a negative provocative Wassermann reaction or a negative luetin test.

3. The initial diagnosis, origin of infection, and principal lesions will be noted on page 2. Other important symptoms and memoranda worthy of remark will be noted under progress of case.

4. The serum tests to determine the status of the infection will be recorded by the dates and places thereof under serum reactions, indicating in the result column the nature of the reactions by the symbols + +, +, + —, and —.

5. The medicines used and methods of administration will be noted by successive entries in the appropriate columns under treatment.

6. The stations where the patient serves or is confined during the period of observation and his movements from one to another will be recorded on the next to the last page.

7. When the patient is sent from one station or command to another the register will be sent to the surgeon of the new station or command in time to arrive with or before the man, if possible. If the register does not arrive within a reasonable time the surgeon will so advise the surgeon of the old station or command, and meanwhile will start a new register until the original one is received.

8. Each medical officer will initial the entries made by his direction. He will sign in the appropriate columns the prescribed record of treatments.

9. On cure, or on termination of service or confinement, without reenlistment, the register will be forwarded to the Surgeon General.

PROGRESS IN MEDICAL SCIENCES.

GENERAL MEDICINE.

G. B. CROW, Passed Assistant Surgeon, United States Navy.

MACARTHUR, W. P. A note of three cases of enteric fever inoculated during the incubation period. Jour. Roy. Army Med. Corps, XXII, No. 6.

The writer administered the prophylactic to several persons who had been exposed to typhoid, and three of them developed the disease, positive blood cultures being obtained in these cases two days after the second inoculation, six days after the first, and four days after the first, respectively. These cases were treated with vaccine and "although the prophylactic dose is considerably larger than an initial curative one, there was no indication whatever of the production of any negative phase. On the other hand, there appears to have been quite an opposite effect, as is witnessed by the extraordinary mildness of these attacks."—(T. W. RICHARDS.)

MOORE, J. W. The modern treatment of chancroids, with an analysis of 33 cases. Medical and Surgical Reports of the Episcopal Hospital, Phila., II, 1914, pp. 412–421.

After briefly discussing the cause and special features of chancroids, the author suggests that the indication to correct the lesion into a simple, noninfected ulcer is best attempted by cauterization, alone or with curettage, excision, or radiant heat.

First the entire penis is rendered clean by washing thoroughly with green soap, water, alcohol, and bichlorid solution 1:1,000, and locally anesthetized. For superficial ulcers carbolic acid is the best and is applied with a glass rod, making sure no portion escapes, followed in one or two minutes by alcohol; for deep, extensive ulcers, nitric acid or actual cautery, followed by sodium hydrate. Actual, Paquelin, or galvanic cautery is considered most efficacious in severe cases, but a general anesthetic must be given.

A treatment used by Peterson of Petrograd, from which a rapid recovery is to be expected, is as follows: The lesion is cleansed with water and gauze, cocain is applied for 5 to 10 minutes, then nitric acid is flooded upon the sore, care being taken to work it well

beneath the overhanging edges into all pockets; after which the acid is allowed to remain two to three minutes, the lesion is wiped with blotting paper; then with a sharp curette the slough is thoroughly and deeply removed until clean, smooth, healthy looking tissue is reached. They further advise that the ulcer be touched with 10 per cent silver nitrate and wet dressings applied.

Excision is recommended as an excellent procedure if done early and when there is doubt as to the diagnosis.

Fulguration has no advantages over the other methods and is rather condemned.

Subsequent treatment consists in cleansing with H_2O_2 and dressings wet in boric solution, Thiersch's solution, or lead water and alcohol.

When there is inflammatory edema, cauterization is contraindicated and the parts are treated by prolonged immersion in hot water, hot sodium bicarbonate, spraying with peroxide and 1:1000 protargol solution, followed by frequent dressings wet in a solution of:

℞

Hydrarg. chlor. corros.	gr. vi.
Zinci sulphatis	gr. ix.
Acidi borici	ʒ i
Glycerini	ʒ i
Aquae	℥ vi

or of ammonio-sulphoichthyolate 1:1000.

In the healing stage, scarlet red, balsam of Peru or basic fuchsin may be used, but powders are to be avoided as they tend to cake, retain secretion, and induce bubo.

Vaccines have not given satisfaction.

Phimosis is best treated by subpreputial injections with a 1:1000 solution of protargol or weak bichlorid and the penis wrapped in wet dressings of antiseptic solutions. If edema progresses dorsal incision is made, followed by cautery. Paraphimosis is similarly treated.

In the phagedenic type rest in bed, general tonics, nutritious diet, possibly mercury and iodids, actual cautery, and hot sitz baths are indicated.

Radiant heat is suggested. The X-ray in about one-half the erythema dose, 2 milliamperes of current at a distance of 6 inches for 10 minutes, may be tried only in the phagedenic type with possibly good results.

Total extirpation of bubo is to be feared, but it is recommended that small incisions be made into the glands, pus expressed, and iodoform gauze inserted. A ruptured bubo should be freely opened and curetted, removing the broken down portions of glands and iodoform gauze inserted. Treat nonsuppurating cases by rest in bed, cold, counterirritants.—(W. E. EATON.)

KLANDER, J. V. **The treatment of burns.** Medical and Surgical Reports of the Episcopal Hospital, Philadelphia, 1914, II, pp. 142-147.

The results being about the same clinically, the treatment, in a general way depending upon the degree, the extent and the stage of the injury, is given by the author as the same for burns resulting from the commonest sources. He advocates hydrotherapy, hot wet packs, electric-light packs, and the Schede open method, in which occlusive dressings are eliminated, strict cleanliness, drainage, and heliotherapy thus being obtained.

All burns should be cleansed with normal saline, peroxid, tincture green soap, sterile olive oil, alcohol or benzine, except when there is much charring or extensive and severe injury and the patient's condition is unfavorable.

First-degree burns are treated with bland powders, as the stearate or oxid of zinc, and soothing lotions of sodium bicarbonate or aluminum acetate.

The author discusses briefly several theories purporting to prove the cause of death from burns, and in conclusion states that the exact nature of the toxin with which we are dealing has not been determined, but it would seem from experimentation that death following burns is in all probability due to an autointoxication.

It can be seen, therefore, that local treatment, by whatever remedy, used early is of little avail, but is of value later and is then governed by the surgical principles underlying the treatment of any similar surgical condition of necrosis, granulation, and healing.

The author gives the indications for treatment as "Treat shock—the maximum of two evils present—which occurs as frequently in burns as in any other great injury; treat the burned areas aseptically and surgically, and at first from a standpoint of shock. Combat the autointoxication. Treat the conditions arising during convalescence."

Shock is treated by the use of morphin for pain; stimulation by atropin, strychnin, camphorated oil, caffein, or digitalis; moist heat, autotransfusion if possible by saline solution and adrenalin intravenously, by hypodermoclysis, or enteroclysis, the latter continuously, and administer oxygen. Baths are not considered favorably except in extreme cases.

Locally, cleansing and anointing with boric-acid ointment and sterile dressings are used at first.

Later are given a diuretic, cathartic, large quantities of water by mouth, skin, or rectum, milk diet, hot sweats by hot wet, steam, or electric packs, followed by external heat. This treatment is continued for 4 to 6 days.

Externally, as soon as possible the areas are left undressed, protected by blanket-covered cradles, cleansed with peroxid or other

solutions; crusts are softened by ointment and removed, and the areas then dusted with stearate of zinc. "The lesions are exposed to the direct rays of the sun for one hour or more a day." Early skin graft by Thiersch's method is applied.

The prognosis depends upon the extent of the skin surface involved. Comparatively small areas may result fatally. The mortality under the new form of treatment has decreased.—(W. B. EATON.)

PARK, W. H., and NICOLL, M., jr. **Experiments on the curative value of the intraspinal administration of tetanus antitoxin.** Jour. Am. Med. Assn., July 18, 1914.

Park and Nicoll produced tetanus in guinea pigs, and after the onset of symptoms they determined the relative value of the subcutaneous, intravenous, and intraspinal methods of administering antitetanic serum. All the animals treated by the subcutaneous method died; nearly all treated by the intravenous method died; and practically all treated by the intraspinal method lived. In most cases very much larger doses were given by the subcutaneous and intravenous routes than were given by the intraspinal route, but while these enormous doses tended to prolong life, they did not greatly modify the mortality percentage.

The authors recommend that in tetanus in man the antitoxin be given intraspinally and intravenously. They do not believe that intraneural injections are of any particular value. Four cases are reported and two others referred to as treated by this method, and all recovered. Symptoms had been present 6 to 48 hours before treatment was begun. The doses were from 2,000 to 5,000 units in the spine and from 1,300 to 13,000 units in the vein, repeated in most cases on the following day. They recognize the importance of symptomatic treatment in conjunction with antitoxin.—(G. B. C.)

McGUIGAN, H., and HESS, C. L. v. **Hexamethylenamin.** Arch. Int. Med., June 1914.

Hanzlik and Collins and others have failed after the administration of hexamethylenamin to find formaldehyd in any of the body fluids except gastric juice and urine. The writers thought that there was a possibility that formaldehyd might be liberated and not detected, since McGuigan had found that small amounts are oxidized so rapidly in the blood that it quickly escapes detection by ordinary means. To meet this objection they dialyzed the circulating blood in animals through collodion tubes interposed between the carotid artery and the external jugular vein. The tubes were immersed in

normal saline solution and the living blood dialyzed during the action of the drug. Any formaldehyd formed will rapidly pass into the immersion solution and can be identified by the usual tests. They found hexamethylenamin in every case, while formaldehyd was never detected.

They conclude that since, after the administration of hexamethylenamin, free formaldehyd appears only in the gastric juice and acid urine and not in other secretions or in the blood, the liberation results from acid reaction and not from cell action. Even if it were liberated in other locations it would probably have no beneficial action because of its reconversion or rapid oxidation into injurious products. Combined formaldeyhd as hexamethylenamin does not decompose readily except in an acid medium, when the action is that of weak formaldehyd. The only apparent indication, therefore, for the administration of the drug is in infections of the urinary tract.—(G. B. C.)

HINMAN, F. **Hexamethylenamin as an internal antiseptic in other fluids of the body than urine.** Arch. Int. Med., June, 1914.

Authorities are agreed that hexamethylenamin is present after internal administration in practically every fluid of the body. Because of its ready conversion into formaldehyd in the urine, it has been assumed by some investigators that such conversion occurs in these other fluids; and some observers have presumably regarded hexamethylenamin itself as of antiseptic value.

Recent investigators state that free formaldehyd is not found in the normal fluids or excretions of the body, the urine excepted. Hinman states that the apparent confusion on this point is due to the character of the tests employed. In those cases in which free formaldyhyd has been reported as present in these fluids after the ingestion of hexamethylenamin, the tests that have been used employ strong acids, which, by their action on the hexamethylenamin liberate formaldehyd, which then reacts.

It has been shown by Burnam, Jordan, and Hanzlik and Collins that hexamethylenamin itself has no germicidal or antiseptic power, even up to a 2 per cent solution. Hinman and others found formaldehyd to be a slow and relatively weak germicide, but up to high dilutions it has a powerful inhibitory influence on bacterial development. In a dilution of 1:16,000 formaldehyd completely inhibits the growth of bacillus typhosus, and in a dilution of 1:30,000 it will partially restrain growth.

With these facts in mind, Hinman undertook to find whether infection could alter the normally alkaline body fluids sufficiently to produce the liberation of formaldehyd, and, if so, whether there

would be enough liberated to produce antisepsis. The work included the testing for formaldehyd of both normal and pathological fluids of patients being fed hexamethylenamin, and the determination of whether or not these fluids would liberate formaldehyd *in vitro* when subjected to infection. The following fluids were studied: Cerebrospinal fluid, pus of otitis media, pus of empyema, pus of pelvic abscess, blood serum, sweat, saliva, and bile.

Hinman reached the following conclusions:

Hexamethylenamin is dependent on the liberation of formaldehyd for its antiseptic value.

Hexamethylenamin is not converted into formaldehyd in any of the normal alkaline fluids of the body; therefore, it can be of no prophylactic value in any of these fluids.

After some infections of these fluids there may be, under certain conditions, a change in reaction sufficient to produce a slight liberation of formaldehyd, but this was never found to be sufficient to produce antisepsis.

In localized infections of pronounced acidity (pus tube, empyema) hexamethylenamin is not taken into them in sufficient amounts to furnish formaldehyd in antiseptic strength (the gall bladder possibly excepted).

The therapeutic use of hexamethylenamin as an internal antiseptic is justified, experimentally, for urinary conditions alone, and then only when it is excreted into an acid urine.—(G. B. C.)

GORDON, A. **Lumbar puncture as a special procedure for controlling headache in the course of infectious diseases.** Therapeutic Gazette, June, 1914.

Headache, in the course of infectious diseases, may be the most conspicuous and the most disturbing symptom. It may be so pronounced and so persistent that the patient is unable to sleep and becomes nervous or even delirious. Among a large number of such cases Gordon has carefully followed up 40 from the onset of the disease till convalesence was established. There were 25 cases of typhoid, 10 of influenza, and 5 of pneumonia. The headache which developed in these cases was of unusually severe type, and it was only after ordinary methods had failed to relieve this symptom that lumbar puncture was resorted to. Contrary to what is observed when spinal fluid is withdrawn from normal individuals, in infectious diseases the headache is generally relieved almost at once or totally removed. In the cases of grippe one or two punctures were sufficient. In typhoid and pneumonia several punctures were necessary, but relief followed each puncture, and after each subsequent puncture the duration of the improvement was more and more pro-

longed. In all these cases the tension of the fluid at the time of puncture was high. In some the fluid showed a high leukocyte count; others contained an increased amount of albumin. Bacteria were absent in all. Gordon believes that the headache in these cases is due to an irritative or inflammatory state of the meninges produced by the toxic products of the infection. By removing a fluid laden with toxic products the intoxication of the subjacent nervous tissue is correspondingly decreased. The amount of fluid withdrawn should depend upon the tension. Gordon usually limits the amount to 15 or 20 c. c. at first, but if the tension is very high 30 to 40 c. c. may be withdrawn. He considers the procedure without any danger and believes it deserves extensive use in infectious diseases accompanied by severe and prolonged headache.—(G. B. C.)

BASSLER, A. **Cardiospasm. What is it? What it seems to be.** New York State Jour. Med., xiv, No. 1.

Bassler states that textbooks describe cardiospasm as a spasm at the cardiac orifice of the stomach. As a result of dissections of this region and of X-ray studies in seven cases of so-called cardiospasm he believes that the term is a misnomer.

In dissections it is rare to find a grouping up of the muscle fibers at the cardiac opening of the stomach, and when present this grouping forms at best only a very weak sphincter, one easily overcome in life by any weight of food (particularly fluid) above it, even when spasmed. The esophagus is narrowed at the point where it passes through the diaphragm—a distance of 1½ inches above the cardiac orifice of the stomach. X-ray examinations show that this narrowing is due to a state of tonus that exists normally in fibers of the crura that surround the esophageal opening of the diaphragm. Above this point the esophagus is somewhat bulbous and below this point it widens out, funnel-like, to the stomach. In the X-ray studies of the cases of cardiospasm the patients were given bismuth and pictures taken first in the upright position. It was plain that the bismuth descended to the esophageal opening of the diaphragm and was held there. After considerable bismuth had passed the stricture the patients were X-rayed in the horizontal position, lying on the right side so as to outline the fundic end of the stomach and the lower end of the esophagus, and afterwards plates were taken with the patient's head downward to permit gravitation of the bismuth to the upper part of the stomach. Each of these showed that the stricture was at the esophageal opening through the diaphragm and not at the cardiac orifice of the stomach or in the abdominal portion of the esophagus. As dissections show that the esophagus has no sphincter

of its own at this point it seems warranted to assume that the fibers of the crura exercise a sphincter action on the esophagus. If such is correct it would appear that in intractable cases the approach to the stricture (point of spasm) had best be made by the safer abdominal route rather than through the thorax. The writer further suggests that division of the crura, either at their insertions or at some point in the esophageal opening, is worthy of consideration.—(G. B. C.)

Bryant, F. A. **Acromion auscultation: A new and delicate test in the early diagnosis of incipient pulmonary tuberculosis.** Jour. Am. Med. Assn., May 23, 1914.

Bryant calls attention to and gives his opinion regarding this test which was apparently originally described by Robert Abrahams and Nathan Magida.

The technique is very simple. The bell of an ordinary stethoscope is placed as nearly as possible over the acromio-clavicular articulation (if the reviewer is not mistaken, Abrahams recommends the upper surface of the extreme outer end of the clavicle rather than the articulation). In bony individuals it may be necessary to draw the skin and loose tissues around the mouth of the stethoscope with the disengaged hand in order to make an air-tight connection. Care must be taken, however, to keep this skin cushion motionless or else extraneous and confusing sounds will be heard. Rarely slight friction sounds produced in the acromio-clavicular articulation may be heard and on account of their similarity to those of mucous rales and clicks caution must be used to differentiate such sounds from those originating in the lungs. The bell stethoscope must always be used, because the flat surface of the phonendoscope can not be adjusted to the part auscultated. With the stethoscope properly adjusted the effect of ordinary respiration should first be observed, after which the effect of deep breathing, the spoken voice, whispers, etc., should be noted as in direct auscultation of the apices. The writer suggests that the beginner with this method should first select cases that have been diagnosed by other means in order to start with a known condition.

Acromion auscultation is based on the principles involved in the production and transmission of sound. The clavicles, on account of the connection at their inner ends with the manubrium and first ribs, the posterior surfaces of which lie directly over lung tissue, and with their own inner concave surfaces lying across and on the apices of the lungs, act like the sounding board of a musical instrument, which greatly increases the intensity of the original vibrations.

It is stated that the method is most reliable in the diagnosis of very early cases; that pathognomonic sounds about the apices due to

changes in the walls of the infundibula can be elicited earlier in the disease by this method than by any other. In more advanced cases this method is not as satisfactory as direct auscultation.—(G. B. C.)

EUSTIS, A. **Diabetes mellitus and its differentiation from alimentary glycosuria.** Am. Jour. Med. Sc., June, 1914.

Ten years ago the individual whose urine reduced Fehling's copper solution was considered a diabetic, and that individual was told to prepare for the worst. Many such persons, however, failed to die as forcasted, and some after a variable time became permanently sugar free. This led to more thorough study of these cases, as a result of which the condition "alimentary glycosuria" is now well recognized.

The underlying factors in the production of diabetes are still in considerable obscurity. Pathologists have found that in some cases certain abnormal changes are present in the pancreas; in other cases pathological changes appear limited to the liver; and in still others no lesions whatsoever can be demonstrated. Physiologists have also attempted to elucidate the condition. Von Noorden believes that the pancreas through its hormone inhibits the normal tendency of the liver to give up its glycogen, and that failure of this action results in hyperglycemia from the overproduction of glucose. He does not think there is any lack of ability in the tissues to utilize the glucose in the blood. Recent experiments of Knowlton and Starling, on the contrary, indicate that the pancreas not only has an influence on the glycogenic function of the liver, but that it most certainly has a decided influence on the utilization of glucose by the tissues.

It has been thoroughly accepted that the pancreas secretes a hormone which is absorbed by the blood and in some way presides over the glycogenic function of the liver. Anything affecting the cycle between the pancreas and the liver will result in glycosuria, or anything causing a rapid rise of the dextrose in the general circulation will cause a glycosuria, maltosuria, or galactosuria, depending in great part upon the particular carbohydrate eaten. The main point to bear in mind is that whenever the normal glucose content of the blood (about 0.09 per cent) is exceeded, the kidneys will excrete the excess and glucose will appear in the urine. (Recent work indicates, however, that the amount of sugar in the urine is not always proportional to the degree of hyperglycemia; in other words that some kidneys, probably pathological, hold back this excess sugar in the blood to a greater or less degree.—G. B. C.)

Alimentary glycosuria, as distinguished from true diabetes, is a temporary glycosuria and is due to the ingestion of excessive amounts

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of substances that may be converted into sugar. Patients partaking of large amounts of milk often show a reduction of Fehling's solution, not because they have a true diabetes, but because their normal liver function has been overtaxed, with consequent passive congestion of this organ, so that it is unable to transform the galactose formed from the lactose in the milk into glycogen. Another example of alimentary glycosuria is that of the person who eats large amounts of sweets, occasionally or constantly, and whose urine contains sugar. These cases do not have the thirst, loss of weight, and nervous manifestations accompanying diabetes, and the urine does not contain diacetic acid or acetone.

In diabetes mellitus there is not only a failure of the entire body to utilize the dextrose of the circulating blood, but there is a predilection for fat and proteid as fuel in preference to carbohydrate, with consequent formation of beta-oxybutyric acid, diacetic acid, acetone, etc., from incomplete combustion of these foodstuffs.

In the consideration of the treatment of diabetes, Eustis emphasizes that complete withdrawal of carbohydrate food from a diabetic for a long period of time invariably results in an acidemia, commonly spoken of as diabetic coma, in which beta-oxybutyric acid, diacetic acid and acetone are usually found in the urine; also that in the metabolism of proteids about 50 per cent of the proteid molecule is split off as a carbohydrate radical, and that this accounts for the continued presence of dextrose in the urine even after complete withdrawal of all carbohydrate food. Dextrose itself is relatively nonpoisonous in comparison with the other cleavage products of proteids, and before outlining a diet this fact should be borne in mind.—(G. B. C.)

GARBAT, A. L. **The complement fixation test in typhoid fever: Its comparison with the agglutination test and blood-culture method.** Am. Jour. Med Sc., July, 1914.

The diagnosis of typhoid fever is frequently in doubt in spite of the many laboratory tests now in use. Positive blood culture, of course, settles the diagnosis, but late in the disease blood cultures are not often positive and equipment for making such examination is not always at hand. In such case the main reliance in diagnosis must be placed upon the Widal test or the leukocyte and differential count. The Widal test has lost most of its value as a diagnostic aid in cases that have received typhoid prophylactic treatment, as the latter produces a strongly agglutinating blood serum.

The possibility of employing the complement fixation test in the diagnosis of typhoid fever has often been suggested, and the author undertook a systematic investigation of the method regarding:

1. The frequency of its positive finding, its time of appearance, and persistence.

2. Its comparison with the agglutination test and blood-culture method.

3. Its occurrence after active immunization against typhoid fever.

The author's antigen was made according to Wassermann-Citron's directions for preparing artificial aqueous aggressins. In brief the antigen is a concentrated aqueous extract of typhoid bacilli that have been grown upon agar.

The details of the technique should be obtained from the original article. Garbat's conclusions are quoted:

1. Practically all typhoid fever patients examined, sooner or later developed antibodies in their serum, which were demonstrable by the method of complement fixation. These bodies increase in number during the progress of the disease and are especially numerous during convalescence.

2. A highly polyvalent antigen properly prepared is absolutely essential in order to obtain a maximum of positive results.

3. Strains of typhoid bacteria may differ from each other in that their respective antibodies can not fix complement with an antigen made from a different strain.

4. There is no definite relationship between the occurrence of a positive Widal and complement fixation test on the one hand, with a positive blood culture on the other.

5. When the blood culture is negative, as so frequently happens in the later stages of typhoid fever, a positive complement fixation test is especially of value. Occasionally the test is positive before the Widal or blood culture.

6. The simple technique of obtaining 1 c. c. of blood is in marked contrast to the considerable and at times impossible preparations required for blood culture. The ease of transportation of the specimen also adds to its value.—(G. B. C.)

MENTAL AND NERVOUS DISEASES.

R. SHEEHAN, Passed Assistant Surgeon, United States Navy.

SWIFT, W. B. **A voice sign in chorea.** Am. Jour. Dis. Child., June, 1914.

Many writers have used varied and vague terms in the description of the voice in chorea.

By the use of the voice kymograph Swift demonstrated that a definite vocal change very constantly accompanies choreic movements. The voice kymograph is an instrument to register sound, and consists of a mouthpiece and nose piece connected by a closed

tube, with a membrane from which a lever extends to a revolving drum covered with smoked paper. When the apparatus is connected up with the respiratory passages the needle records respiratory air pressure and vocal-cord vibrations and variations in the pressure and vibrations. By the use of this instrument Swift found that the vocal change in chorea consists of a sudden rise in the intensity and pitch of the voice in rendering certain sounds, most marked in sounding the vowel "a" as in "around." The drum records show during the sounding of the vowel "a" a rather sudden rise in pitch and intensity followed by an equally sudden fall. The writer believes that the increase in intensity comes from increased contraction of the expiratory muscles and the rise in pitch from increased contraction of the muscles of the vocal cords. He considers that change of pitch and intensity of the voice are signs of chorea that should rank with the choreic knee jerk of Shaw and the respiratory sign of Graves.—(G. B. C.)

FILDES and McINTOSH. **The Wassermann reaction and its application to neurology.** Brain XXXVI, part 11, 193.

In a very complete article the writers maintain that the mere report of a Wassermann test is valueless without a knowledge of the method used in obtaining it. After careful study in many neurological cases they conclude that the best antigen is a cholesterinized alcoholic extract of fresh human heart. This has the advantage of not varying, of giving a much higher percentage of results in undoubled lues and displaying no nonspecific results as found by Walker and Smith. Kolmer, and others.

The inactivation of sera produces a reduction in the quantity of the reacting substances greater than that produced in inactivated spinal fluids. The preliminary titrations and dilutions are clearly explained.

Their results in the various stages of syphilis coincide with those already reported. Briefly, these are—

(1) The reaction is negative in nonsyphilitic diseases of the central nervous system. (2) The occurrence of a positive reaction in the spinal fluid is indisputable evidence of luetic infection. (3) The reaction in cerebrospinal lues varies much, according to the location of the process, being inconstant, weak, or negative except when the cord itself is involved, in which case the reaction is remarkably strong. Moreover, in this group of cases they find positive reaction more often in cases showing recent lesions. (4) In general paresis a strong reaction is nearly always present in both serum and spinal fluid, the same being true of tabes, unless examined

after the disease has existed for some time or has been well treated. (5) So common is the occurrence of a positive reaction in the spinal fluid and a negative one in the serum and vice versa that the negative finding of one alone is not sufficient evidence to exclude syphilis. As regards the results of specific therapy, the authors call particular attention to the fact that some cases of paresis and tabes should not be grouped as true parasyphilitics, since they are really active syphilis. The best results of treatment are in those cases where there is evidence of active meningeal involvement, cases which are regarded as transition forms between paresis and cerebrospinal syphilis. Treatment has practically no effect upon the Wassermann in pure parasyphilitic cases, a result so different from that seen in cerebrospinal lues as to be of real value in a prognostic sense. It would seem that the rapidity with which a positive spinal fluid can be reduced to a negative state has little relation to the duration of the disease process. This is the reverse in the serum in which the chemistry of the disease varies directly with the rapidity of change in the reaction. It is concluded that the salvarsan provocative test has been given an exaggerated diagnosic value.—(R. S.)

AYER, J. B. **Salvarsanized serum (Swift-Ellis treatment) in syphilitic diseases of the central nervous system.** Boston Med. and Surg. Jour., March 26, 1914.

This is a consideration of the intraspinal method of treatment with a citation of cases. This procedure was evolved in an effort to reach cures refractory to other forms of treatment. It presupposes living spirochetes as the infecting agent, harbored in the lymphatc system and interstitial substance of the brain and cord and supposedly cut off from the blood stream and therefore can not be reached by drugs which can not pass into the spinal fluid. It puts salvarsan in its most effective form, namely, in combination with serum, without which, as pointed out by Erlich, it is not spirocheticidal. Perhaps the benefit is rather from the serum than the drug, the quantity of which reaching the spinal cord must be minute.

The original technique was followed—that is, one hour after an intravenous injection of salvarsan about 40 c. c. of blood are withdrawn under aseptic conditions and allowed to clot; the next day the serum is removed and mixed with normal salt solution to make 30 c. c of a 40 per cent strength of serum; this is heated to 50° C. for one-half hour and injected by gravity into the spinal canal, replacing an equal amount of spinal fluid withdrawn.

Symptomatic improvement is easily obtained, but to bring the spinal fluid to normal appearance is difficult and this is the criterion of cure.

In summarizing results the writer states that in lower cord tabes treated for a long period of time there was marked symptomatic relief, pains, bladder conditions, general strength, and weight all improved. The cases with optic atrophy have been most resistive to treatment. It has not been found that optic atrophy contraindicates the use of salvarsan; while it does no harm it, however, has been of little good in these cases.

In the cases diagnosed as general paresis distinctly less benefit was noted; while laboratory improvement was obtained, it was done only with difficulty.

In cerebrospinal syphilis, especially with a latent period of a few months, or a very few years at most, marked benefit was observed. There was an improvement in symptoms and laboratory tests.

So that in a group of 18 cases refractory to other forms of treatment, 14 were distinctly improved, 1 unchanged, 3 went on uninterruptedly. Of the 4 not benefited 2 were paresis and 2 tabes, each of the latter having optic atrophy. The improvement has been marked, but not rapid, being rather slow and steady.

Treatment was always followed by reactions. There were severe pain, usually confined to legs, a rise of temperature, and occasionally hallucinations. The reaction lasts 24 to 36 hours.

The conclusions are that the method is safe and effective in cases where other treatment failed. Its greatest effect was in cerebrospinal syphilis cases, in which a cure may be obtained in some cases with persistent treatment. In tabes the process may be arrested. In paresis no effect was obtained except in the preparetic stage.

Because of the exact technique and laborious control tests it should only be used by those especially trained in its use.—(R. S.)

GORDON, A. **Mental manifestations in tumors of the brain.** The Am. Jour. Med. Sc., August, 1914.

Under this title the author reviews the literature and cites a number of descriptive cases. At present it is not possible to determine with any accuracy the relation between any particular tumor and the mental symptoms occurring, nor is it possible to draw inferences from the seat of the tumor. Attempts have been made to attribute certain mental disturbances to tumors in various localities of the cerebrum, but the reports are largely contradictory.

In the majority of tumor cases disturbances of the intellect occur. They vary from simple intellectual sluggishness to global dementia. Among the manifestations, a stuporous state predominating in most cases, a state of somnolence is usual. Indifference and apathy are common. Intellectual effort and initiative are absent. The patients are childish, impatient, obstinate, not infrequently irritable, emotional, and easily angered. The mnemonic sense is affected. These

mental symptoms may occur some time before the characteristic headache, vomiting, vertigo, and choked disk, and thus obscure the diagnosis. A diagnosis of tumor can not be based on the presence of any special mental symptoms.

Delusions, hallucinations, confusional or delirious states characteristic of genuine psychoses, may all accompany tumors of the brain. Of a series of 775 cases of tumor (Shuster and Knapp), in 423 cases mental weakness and dementia were present. In the other 352 cases gross mental disturbances suggestive of distinct psychoses were observed. These were maniacal states (95), depressed states (57), hallucinatory delirium (52), general paralysis (29), and paranoia (19).

There does not seem to be any relation between the size or location of the tumor and the degree or character of the mental symptoms.—(R. S.)

PUTNAM, J. J. **Some of the broader issues of the psycho-analytic movement.** Am. Jour. Med. Sc., CXLVII, March, 1914.

The psycho-analytic method is not simply a means of palliation. It depends on the fact that these patients are victims of emotional conflicts, the mechanism of which they can not comprehend without help, and is an effort to enable them to relieve themselves through self-study and self-education from the effects of these conflicts.

The endeavor should be to get the patient to place reliance upon himself for the success of the analysis, so that it may result in complete independence on his part.

There are some cases which are not amenable to this form of treatment, but if care is used in the choice of patients, the operator is well schooled, and the patient sincere, some benefit is sure to be obtained. The phobias and anxiety neuroses are the most likely to be cured, while the compulsion neuroses are not as susceptible and the well-marked hypochondriacs not at all.—(R. S.)

KING, E., Capt., M. C., U. S. A. **Mental disease and defect in United States troops.** Bulletin No. 5, Surgeon General's Office, War Department.

This is rather a comprehensive work and is the result of the experience of the writer during over two years' detail at the Government Hospital for the Insane. It includes not only a valuable consideration of psychiatric literature, but also pertinent conclusions which will surely prove of value. The reader will be impressed with the pervading dogmatic tone. However, this is permissible and perhaps desirable, as the bulletin is intended for medical officers, and particularly those on recruiting duty, most of whom have no special interest

or knowledge of the subject. These will find it of good utility and practically all meat.

In the introduction attention is called to the importance of the problem of mental diseases from a military viewpoint. In 1912 the percentage of disability discharges for mental alienation was 20 per cent, the discharge rate per 1,000 being 264, which is higher than any other cause. That is, 200 men were found mentally incapacitated, which figures would be increased if hysteria and neurasthenia were included.

Particular emphasis is laid upon dementia precox, because more than half of the Army admissions for mental disease were of this form. No doubt many of the desertions and those discharged as undesirable were of this class.

After considering the history and nature of the disease the cause is taken up, emphasizing the fact that the age involved is that of the likely recruit and that 70 per cent of cases show a hereditary taint.

In the course, symptomatology, and prognosis the writer closely follows the Kraepelinian teachings. The fact is noted that the precox process may be present and producing changes in the mental life and character and conduct of an individual months or years before the disease becomes frankly manifest. This accounts for soldiers who persist in repeated alcoholism, those who desert without apparent cause and shortly afterwards fraudulently reenlist even though aware of the certainty of punishment, the practical failure, those unable to "get along," the persistent sexual debauchees, the inadequate and inefficient. Numerous characteristically descriptive cases are cited under the various forms of precox, the hebephrenic, catatonic, paranoid, and mixed.

Under manic depressive psychosis it is noted that this is a comparatively rare disease in the service. This entity is traced in the fluctuations, according to different authors, from the all-inclusive idea of Kahlbaum to the more limited one held at present.

Points noted are the usually hereditary cause; that attacks often occur without apparent reason; not to regard the disease as "line of duty" without carefully searching the history for previous attacks. The excitements of precox are frequently mistaken for this condition.

The best test of recovery is insight. All cases realize that they have been insane, thus differing from precox. Recovered cases should not be returned to the service.

Paranoid states are a frequent occurrence in service cases. It is concluded that 5 to 8 per cent are paranoid precox and that none recover, and that a paranoid picture may be present in other forms of psychosis.

General paresis, next to dementia precox, is the most common mental disease in the military service. It is sharply defined clin-

ically and is easily diagnosed by the laboratory findings. It is suggested that all cases be thoroughly examined physically and neurologically as well as mentally to avoid error.

Precautionary measures should be taken to prevent the enlisting of syphilitics. The intensive treatment of those in the service and the risk of allowing these potentially insane men on duty, particularly in war time, when the onset of paresis may cause disability, are emphasized.

In cerebral lues no one type of mental picture occurs regularly. There may be simple deterioration, paranoid states, excitements or depressions, a paretic-like condition or a neurasthenic picture, and this latter is an important condition.

The mental impairment associated with arteriosclerosis is emphasized. Alcohol is considered the important factor in producing the vessel change.

There are failure of interest and loss of productivity, which are serious in an officer holding an important command. The power of comprehension is lessened; they are easily fatigued mentally, and there is irritability and depression. Not a few officers become mentally inefficient from arteriosclerosis before the age of retirement. They are practically certain to break down under any stress of service.

In the chapter upon "Exclusion of the imbecile and moron from the Army" attention is called to the necessity of a correct life history and the connection between the stigmata of degeneration and deficient mental powers. Waiving of physical defects in applicants for enlistment is risky. It is better to keep close to the normal standard.

The writer suggests that it would be advisable at the recruiting depot to send all men who do not do as well as the average in their routine work to the surgeon for mental examination, so that it may be definitely determined whether it is advisable to expend further time and money upon them.

Under the heading of psycopathic make-up is considered a class of individuals who cause the service lots of trouble. They can not cope with the world except in their own peculiar way. They are useless in the regular service, as they are unable to adjust themselves to the discipline. They are persistently insubordinate, excessive in and intolerant to alcohol, and are likely to be addicted to sexual perversion. This type is liable to develop a psychosis, when they are unable to escape by desertion, conditions to which they can not adapt themselves.

It is suggested that court-martial offenders be examined mentally so as to avoid returning to duty those of abnormal mental make-up, and in whom this factor was, no doubt, the cause of their offense.

It is not always true that an offender who is able to behave well during his stay at a disciplinary barracks is fit to return to the service. A great number do well under the conditions in such an institution or on probation, but soon lapse when placed on their own responsibility and subjected to alcoholic and accompanying temptations.

In considering border line cases it is stated that if a soldier or officer reacts habitually in an abnormal manner to events in his daily life to such an extent as to make him relatively useless, perhaps obnoxious or dangerous, or not to be trusted, and at all events entirely unsuited for military service, and no frank mental condition is found, and assuming that he is proof against admonition, and that endeavors to teach him to behave in a normal manner are unsuccessful; that rebuke, reprimand, company discipline, and punishment by court-martial only temporarily or not at all improve his mode of reaction to his surroundings, it will probably be found in a careful history of his life that he has always reacted abnormally, and that the cause of his military and civil inefficiency is constitutional, and that he should be discharged on a surgeon's certificate of disability. not in line of duty.

In the concluding chapter the author sums up and emphasizes certain points, such as the difficulty of classification, the paramount importance of dementia precox, which group included 40 per cent or more of admissions here from the military service, and the rarity of manic depressive psychoses. He prefers the use of the terms "depression" and "excitement undifferentiated" to the older terms "mania" and "melancholia," and the same applies to "psychosis undifferentiated." He states that true paranoia is very rare, but that paranoid disease pictures are not infrequent, and the most of these belong to the precox group. Where alcohol is a causative factor he believes it desirable to report such cases as "psychosis associated with alcoholism," thus emphasizing the alcoholic factor, and if the psychotic state be due to cocain, morphin, etc., a similar form of diagnosis makes the case clear.

As this publication is easily obtainable it would well repay reading the original.—(R. S.)

SURGERY.

A. M. FAUNTLEROY, Surgeon, and E. H. H. OLD, Passed Assistant Surgeon, United States Navy.

NASSAU, C. F. **Infiltration anesthesia.** Bucks County, Pa., Med. Month., IV. No. 11.

In this very interesting paper, Nassau, after giving a brief history of the introduction of local anesthesia to the profession, sums up his

large experience with this form of anesthesia in practically every feature of major operative work.

Although Wood presented the hypodermic syringe to the world in 1853 and Gaedeke discovered cocain in 1855, it was not until 1884 that the anesthetic possibilities of cocain were realized when Köller, of Vienna, publicly demonstrated the value of cocain as an analgesic in ophthalmic and surgical work at the Ophthalmic Congress at Heidelberg. In 1885 J. Leonard Corning, of New York, demonstrated that cocain, when applied to sensory or mixed nerves in man, abolished nerve conduction. From this time on the technique of local anesthesia was improved by various investigators working independently in different parts of the world, and the names of Schleich, Van Hook, Halstead, Matas, and Harvey Cushing are mentioned; the latter's paper in the Annals of Surgery, XXXI, 1900, reporting a series of herniotomies, gave a tremendous impetus to infiltration anesthesia. Some of the terms used by various investigators perfecting their own particular technique may cause a little confusion in the minds of those interested in surgical anesthesia. Thus the terms "regional anesthesia" and "terminal anesthesia" are practically synonymous, in that both indicate the blocking off of the sensory nerve supplying a certain area; while the terms "perineural injection" and "endoneural injection" are sometimes used when the writer's technique calls for the injection of the anesthetizing agent either around the nerve or directly into the nerve. Whatever terms are used or coined in describing a particular technique, the whole process is to be called "infiltration anesthesia."

We are all familiar with Crile's anoci-association work which has again brought into prominence the value of judicious nerve blocking in connection with whatever general anesthetic is used, and in view of the practical value to the patient and operator it is highly important for the surgeon to be familiar with an accepted standard technique and be prepared to use it when his judgment dictates the application of this procedure.

Nassau says, "the ideal fluid to be injected should be isotonic with the blood and should contain the smallest percentage of chemical agent necessary to render the part anesthetic. He recommends the solutions used by Mitchell, which are in two strengths. Mitchell's tablets (three-fourths grain cocain and one four-hundredth grain adrenalin) are dry sterilized, and just before operation one tablet is dropped into a cup containing 50 c. c. of saline solution and one tablet in a cup containing 100 c. c. of the same solution. The stronger solution is used for infiltrating the skin, blocking nerves, or for any particularly sensitive area. The weaker solution is employed for general infiltration of tissue. The addition of adrenalin to the cocain solution is an advantage in that it retards the circulation by contracting the nonstriped fibers in the blood vessels of the part; the

cocain being thus localized, its anesthetic action is prolonged and bleeding diminished during operation." The total dosage should not exceed $1\frac{1}{2}$ grains, as aside from the toxic effect of cocain the presence of a high percentage of adrenalin has been the cause of a superficial skin slough. Nassau and others do not believe that adrenalin modifies in any way the toxic action of cocain.

The field of operative possibility under infiltration anesthesia has broadened to such an extent that it is difficult definitely to limit its possibilities in the hands of one skilled in its use. A distinct note of warning should be sounded, however, as to the employment of infiltration anesthesia by those who are not especially skilled in surgical technique, or by those who are not possessed of great patience. As Nassau rightly says: "It is necessary for the surgeon operating by this method to use an essentially different technique from that commonly employed in operations under a general anesthetic. He must be possessed of a calm and equable temperament, skilled in clean operative dissections, and accustomed not to handle tissues unnecessarily. Failure is certain if the operator is not constantly engaged in this kind of work, for he must have learned above all things, gentleness, willingness to spend plenty of time, and to have acquainted himself accurately with the sensibilities of the various tissues encountered in different operative fields. For the occasional operator to attempt major operations under the infiltration anesthesia is to court failure."

Whereas we must not neglect any surgical advance, we must not lose sight of the fact that infiltration anesthesia is a very special field in major operative work, and should be attempted only by those highly skilled in surgical anatomy and technique. It is far from good judgment to follow in the steps of overwrought enthusiasts in any line of surgical work, as, sad to say, there are quite a number of these workers whose chief aim is to attract attention, and who do not report their failures, nor give all the facts necessary for one to arrive at a judicious opinion as to the particular technique advocated. It requires a great deal of painstaking work and study for one to perfect himself in infiltration anesthesia as a routine procedure in major work. Whereas Nassau and others have done practically every major operation under this form of anesthesia it is not wise to think that those who are not highly skilled along this line can do the same. Nor is it wise to advise it as a routine procedure in the hands of beginners or those who have not had a large and wide surgical experience.

Nassau, in his paper, summarized the indications and contraindications as follows:

Patients having abdominal sections done under infiltration anesthesia very rarely vomit after operation, never have as much post-operative pain as those

done under general anesthesia, and they do not have backache. Distention of the bowel is uncommon. The catheter is rarely required, and, of course, the blood changes, renal difficulties, and post-operative pneumonias are much less frequent than following general narcosis. Infiltration anesthesia can not be ignored in such cases as diabetes, Addison's disease, sepsis, advanced Basedow's disease, disease of the cardiac muscles, liver, both kidneys, etc. In children and high-strung individuals infiltration is usually impossible; in operations for extensive malignant growths or where complete muscular relaxation must be obtained, this form of anesthesia is absolutely contraindicated.

Both in Nassau's article and in Da Costa's Surgery (1914 edition) a very complete description of the technique is given. Both of these surgeons speak from an enormous surgical experience, and up to this writing their word is to be taken as the last on this subject.

The following is a description of the technique:

The patient should be informed that operation is to be a matter of intelligent cooperation; and in major operations it is wise to give a hypodermic injection of morphin (¼ gr.) a half hour before beginning. This is usually sufficient to allay the apprehension natural in one about to undergo an operation. Somebody should be detailed to sit by the patient's head to engage him in conversation, sponge his face, administer small sips of water, and, in other words, be what I call the psychic anesthetist. The patient should not witness any of the pre-operative preparations, and instruments should be carefully excluded from the range of his vision. Needless conversation and other noise should be avoided.

The special instruments required are: Two Record syringes of 2 c. c. capacity and one of 5 c. c.; two fairly fine needles 1½ inches long, and two coarser needles 2 inches long; a pair of Mayo's 5½-inch straight dissecting scissors with keen edges; tooth dissecting forceps and fine-pointed artery clamps. For example, let us take an appendectomy in a patient with a frank tuberculosis of the lung—here general narcosis would be very likely to prove fatal. The patient having been prepared for operation (care having been taken to administer morphin a half hour previously) is placed upon the operating table and made as comfortable as possible. The head is arranged upon a pillow, the arms disposed comfortably at the sides and a folded blanket is placed under the lumbar spine. The patient's wishes may be consulted as to whether he desires a piece of gauze placed over his eyes or not. Usually the patient, unless addressed, keeps his eyes closed. The psychic anesthetist engages the patient in conversation, the surgeon is full of confidence, cheerful, and endeavors to communicate his frame of mind to his subject.

The easiest method of approach to the appendix under infiltration anesthesia is McBurney's muscle-splitting incision. Begin infiltration by taking a 2 c. c. syringe filled with the stronger cocain and adrenalin solution. Use a fine needle. Pinch up a small piece of skin, informing the patient that you are going to stick him with a fine needle. Holding the needle almost parallel with the skin, barely insert the point under the epidermis and at the same time press on the piston of the syringe so as to obtain an infiltrated spot simultaneously with the introduction of the needle. The pain caused by the introduction of the first needle is trivial and does not accompany subsequent insertions. A small wheal is now produced in which the integument assumes a blanched, pigskin appearance. From the center of this infiltrated circle the needle can now be painlessly inserted to its full length in the skin (not under the skin) parallel with the surface. Do not insert the needle too deeply at this time. As the point of the needle travels the solution should be fed from the syringe. Ordinarily 2 c. c. of

the solution will infiltrate 1½ to 2 inches of the skin. After the superficial infiltration a coarser and longer needle can be used to infiltrate subcutaneous tissues. The incision can now be made down to the aponeurosis of the external oblique. Now infiltrate the muscular and aponeurotic portion of the external oblique. Make a split in the aponeurosis with knife and finish with Mayo's scissors. Gentle clips with the scissors cause less pain than knife dissection. Retract carefully the aponeurotic layer. Now infiltrate the internal oblique and split it. The transversalis and peritoneum are infiltrated with the stronger solution which we employ at this point for the first time since the infiltration of the skin. Incisions in all layers of the abdominal wall must be of ample size to avoid unduly strong retraction. Up to this stage the patient should experience no pain unless one has thoughtlessly clamped a nerve without previous infiltration with the stronger solution. The visceral peritoneum may be cut, clamped, burned, and stitched with impunity, but undue traction upon the mesentery immediately causes general cramp-like abdominal pain with consequent rigidity of the abdominal wall. The appendix, therefore, is sought by gently following the anterior longitudinal band intra-abdominally rather than by attempting to pull the cecum out of the abdominal incision. Once the base of the appendix is found the rest is easy. Traction on the mesoappendix must be gentle, and before tying it infiltrate with the stronger solution. The crushing, ligation, and inversion of the appendix are not accompanied by pain. Occasionally the necessary traction on the mesocolon will cause the patient to have nausea, which is relieved as soon as the traction ceases. Suture of the abdominal wall now follows without special incident, except that very small gutta-percha tissue drains should be inserted just under the skin at one or both ends of the incision when infiltration anesthesia has been used. These drains take care of any possible oozing that may occur after the effect of the adrenalin has worn off.—(A. M. F.)

De Page, A. **War surgery. President's address; Congress of International Society of Surgery.** Ann. Surg., August, 1914.

The distinguished author of this paper brings out with considerable emphasis the duties of the military surgeon, taking into consideration the opposed European armaments and organizations. Aside from Prof. De Page's wide experience on the battle fields of Europe and his eminent position as a surgeon, his remarks are especially pertinent at this time in view of the present Old World conflagration.

He points out that the vast increase in European armies and equipment, together with the latest advances in siege and field artillery, call for a distinct change in the field surgeon's attitude during and after battle. The recent wars in the Balkans, through all of which the author was an active participant, brought into prominence the relative effectiveness of the French and German ordnance and the change of perspective on the part of the field surgeon in regard to what he should do and what he should not do.

We have all realized for some time that no operative procedures of any magnitude should be attempted, except in extreme emergency, at

the front of the mobile army; but there has been no clean-cut definition of the field surgeon's conduct in regard to the wounded under present-day conditions of warfare. Actual experience on the field, with vast numbers of men slaughtering each other, is the only way to arrive at a correct solution of this many-sided problem. No war has ever been waged in the world's history to compare in magnitude to the present European conflict, although the lessons learned from the Manchurian and Balkan Wars gave us an inkling of what to expect should the much-talked-of general European war take place.

Prof. De Page sums up as follows: "The fate of the wounded depends more than all on the aid which is given in the front of the battle, for as long as the engagement lasts the exposed ground is inaccessible for the ambulance men, of whom more than one has sacrificed his life in spite of all precautions taken; thus hours pass during which the men remain without help."

From the meager accounts that have filtered through the censored press reports of the present war it is quite evident that large numbers of wounded men have been left on the field to shift for themselves. To meet this condition of modern war waging, the following is Prof. De Page's solution:

> Each of the combatants must carry with him, side by side with his cartridges, the objects necessary for a first dressing. This solution has already been accepted and taken into use in different countries; at the most an improvement on this idea could be realized by adopting a model of uniform packet for first aid; but the experience of the late wars has only proved too clearly that, before all, the sanitary education of the soldier must be improved.

Again.

> The military instruction of a soldier in future will not be complete unless it comprises an acquaintance with the necessary measures to take for his personal safety, and especially the elementary rules of asepsis and antisepsis. He must fully realize the dangers of infection by earth, dust, and water. Of what use is a disinfected compress if it is soaked in polluted water?
>
> A soldier must also possess knowledge of certain simple facts; for example, he should be aware that in case of a wound in the abdomen it is better to rest motionless, even if for hours, than to walk as far as a station.
>
> If it is true that immediate help is the most efficacious on the battle field, it must be considered that this help should be limited by precautionary measures. The stations at the front, those temporary erections which change place as the troops change and can not be provided with the necessary implements as hospitals, are only stopping places where the sick and wounded are sorted out. Unfortunately they are not always made use of in this way. During the Balkan War the Turkish Army doctors and others tried to extract the bullets and amputated in the ambulance at the front, and we were able to certify that on the arrival of the wounded at the hospitals of the town the greater part of these interventions had produced deep-seated suppuration.
>
> In the hospitals of the second line, which never change place whatever happens, the operations could be performed that were judged indispensable. There experienced surgeons should be placed, who would have to decide the serious questions, and the most pressing and grave interventions would be decided on

and carried out in these hospitals of the second line, where the wounded could be taken whose condition did not permit of a long transport.

Civil consulting surgeons should also be attached on regular duty. From every point of view this addition seems to be desirable; the presence of these civil surgeons at the hospitals would give them a neutral character, which they have not at present. The capability of these consulting surgeons would assure the utmost caution being used at the critical moment, when the fate of the wounded is in the balance; in short, these tried surgeons would oppose the performance of all operations of which they did not clearly see the urgency. Respect for human life should be our guide. The finest operation is not always the most well directed; neither the battle field nor the surgical clinic allows of experiments on human beings.

The discharge stations should keep up their character, therefore the addition of experienced civil surgeons appears advisable. During the last wars a fact which filled all the surgeons with astonishment was the comparative harmlessness of the modern gun; of it has been said that it is a "humane weapon," as if these two words would not swear at finding themselves together. But for a fact I have seen, and others have also seen, bullets which had pierced the arm or the leg sometimes throughout their whole length, and others the abdomen or the breast or even the back of the brain, without producing infection or any serious consequences. The fact was so generally remarked upon that the military authorities took up the matter; it is not uninteresting to notice this just at a time when the effects of the cannon have become more deadly than ever.

At a meeting of the Imperial Surgical Society at Constantinople, December, 1912, just at a time when we could hear the thunder of the cannons of Tchatalja every day, we expressed the fervent wish that the use of the shrapnels might be abolished on the same grounds as the explosive bullets. Surely we surgeons will not reproach the modern gun for not killing his man with every shot; what we do desire is to reduce the so-called efficacy of the shrapnels.

It would seem from Prof. De Page's paper that the field surgeon's duty is twofold: He should be unremitting in his instructions to troops as regards sanitation, first aid, the conditions and circumstances which are liable to infect wounds, and the rudiments of asepsis and antisepsis. With his troops instructed as to the care of each other when left for hours or days wounded on the field, his line of conduct during battle would seem to be as follows: He would be in charge of a dressing station just behind the mobile troops where he and his assistants could take advantage of every opportunity to secure wounded men, readjust and secure already applied first-aid dressings, sort out and tag the wounded, giving preference to the emergency cases and not attempting any operative procedure whatever unless it be to control hemorrhage. Such stations would be taxed to the utmost not only in trying to secure the wounded under the most hazardous conditions, but in sheltering, feeding, evacuating, and transporting the wounded the field surgeon would have his every energy and resource called into play. The ambulance assistants could not possibly hope to secure any of the wounded from the firing line until there is a cessation of fighting over a certain restricted area. On the firing line each man should have the knowledge neces-

sary to apply correctly a standard first-aid dressing and so dispose of his wounded comrade in the immediate vicinity as would best suit his case until the ambulance men can pick him up.

Everything seems to point to the fact that the warring powers have perfected to the utmost their field and siege artillery, each one boasting of superior destructive powers, while apparently their small arms are intended not so much to kill an opponent as to put him out of the fighting temporarily at least. This, too, has a direct bearing on the field surgeon's conduct in that he will be able to conserve many more lives when not serving with troops under siege or exposed to the decimating fire of large fieldpieces. Wounds from these latter of course tend much more to immediate destruction of life, and, later, to infection, than small-arm wounds. Hence he must be prepared, under certain conditions, with a number of especially large shell dressings, such as adopted for naval engagements.—(A. M. F.)

Tenoplasty; tendon transplantation; tendon substitution; neuroplasty. The Clinics of John B. Murphy, M. D. June, 1914.

In this article Dr. Murphy quotes a number of very interesting cases. The paralysis which rendered operation necessary was due to anterior poliomyelitis, encephalitis, or disease or division of the peripheral nerve trunks.

He has never used silk or other foreign material for tendon substitution, preferring autoplastic means, which he states effect the same end with greater ease and certainty.

Among the cases mentioned were two in which the musculospiral nerve had been severed and the ends could not be found on account of extensive scar tissue. The resulting paralysis involved the extensor muscles of hand and fingers, causing wrist drop and a practically useless hand. The flexor tendons were all in good condition. Operation planned the conversion of the flexor carpi radialis into an extensor muscle by transplanting its tendon into the extensor tendons of thumb and fingers. A longitudinal incision was made on the anterior surface of the wrist close to radial side just internal to the radial artery. The tendon of the flexor carpi radialis was divided close to the tubercle of the scaphoid, the end caught with a hemostat. The second incision was made over the dorsal surface of wrist, exposing the extensor tendons. The proximal end of the flexor carpi radialis tendon was dissected back 3 inches, carried through a tunnel underneath the skin, and brought out through the second incision, in its passage transfixing the extensor pollicis and extensor indicis tendons. The flexor carpi radialis was then split lengthwise into two equal portions, one half carried anterior and the other half posterior

to the extensor tendons of the other fingers. The divided tendon was then sutured to all the other tendons with chromicized catgut. The hand was dressed in extreme extension and held so by anterior wire gauze splint.

Both patients progressed very satisfactorily and in a few months had excellent use of hands.—(E. H. H. O.)

Carcinoma of the male breast. The Clinics of John B. Murphy, M. D., June, 1914.

In his comments on this subject Murphy states that carcinoma of the male breast is much more serious than of the female breast; that the percentage of mortality is much greater in the male, but that it is a rather infrequent occurrence.

The patient to be operated on was a man aged 50. He gave a history of being struck in the right breast by a bottle, thrown at him, October 1, 1913. The breast became swollen, painful, and red. At the end of the week these symptoms disappeared. On October 25, 1913, he leaned against a bedpost while visiting a sick friend, the right breast coming in contact with the post. Shortly after that the breast again became painful and he noticed a small lump to the outer side of the nipple, at the site of prior injury. The lump gradually increased in size and continued painful. He entered the hospital February 18, 1914. At this time the lump was the size of a pigeon's egg, firm, regular in outline, not fixed to chest wall or skin; no pitting of skin; no enlarged axillary glands; no retraction of nipple.

On operation the tumor was removed and immediately examined. Reported by the pathologist as being a scirrhous cylindric-celled carcinoma. A regular breast amputation was then performed with removal of the glands in the axilla.

For amputation of the breast Murphy makes an elliptical incision around the breast with a straight incision along the anterior axillary fold. The lymphatic-bearing aponeurosis of the pectoralis major and the fascia and fat between the pectoralis major and minor are carefully dissected out. The costal and sternal attachments of the pectoral muscles are then divided with scissors. These muscles are dissected free from the chest wall and clavicle and retracted upward and outward. The axillary glands and fat are dissected from the vessels and nerves, beginning at the apex of the axilla and proceeding downward and backward. The long subscapular nerve is carefully preserved. When the axilla is clean the pectoralis minor is turned into the axillary space and sutured over the axillary structures. The pectoralis major is turned in over the pectoralis minor and sutured in place. A stab wound is made through lower flap for drainage. Murphy claims that by using the pectoral muscles, as

described, for filling in the axilla they protect the vessel and nerves and prevent postoperative edema and neuralgia of the arm.

For postoperative treatment Murphy stated that this patient would be roentgenized, beginning about the fifth day after operation.

The reviewer considers that in view of the marked malignancy of carcinoma the advantage of early diagnosis of breast tumors in the male might be again thus brought to the attention of the medical officers in the Navy. It is believed that it would be advisable to send all such cases, especially the older men, to a hospital where an immediate pathological examination can be made during operation rather than remove the tumor aboard ship and wait for a report on its nature; the danger of such procedure in case of carcinoma is well known.—(E. H. H. O.)

MAYO, C. H., and BECKMAN, E. H. **Visceral pleurectomy for chronic empyema.** Ann. Surg., June, 1914.

Attention is called to the fact that chronic empyema results from failure of early diagnosis and establishment of sufficient drainage in the acute stage. If free drainage is established in the acute stage, the lung reexpands quickly. In the neglected case the pleura becomes so thick and fibrous that even after free drainage the lung can not reexpand.

In chronic cases the ribs prevent the chest wall from contracting to fill in the cavity in the way that nature obliterates cavities in tissue.

The operation of Estlander, with its modifications, and of Schede, are reviewed, mentioning their severity and discouraging results in previous years. These are used in conjunction with visceral pleurectomy if necessary.

The authors believe that the operations of Fowler and Delorme have not received the attention they deserve.

Fowler, in 1893, operating for an empyema with a fistula which had been present for 10 years, dissected out the scar tissue of the fistulous tract and removed the fibrous tissue from diaphragm and lung. The lung began to reexpand as soon as the scar tissue was peeled from it. The patient recovered within a few weeks. Delorme performed the same operation in 1894.

Reports of two cases are made in which the thickened pleura was removed from an entire lung in an adult, in both cases more than six months after a primary drainage.

Case 1.—Male, aged 20 years. Nearly collapsed lung on right side with cavity from diaphragm to clavicle. Through an opening large enough to explore the cavity the thick pleura over the entire lung was removed. Lung soon expanded and drainage stopped in 51 days. Breath sounds were good over entire right thorax.

Case 2.—Male, aged 23 years. Left lung involved. Thickened pleura was removed from lung, diaphragm, and pericardium. Drainage ceased in three months. Good breath sounds over entire thorax.

Two other cases are reported in which the cavity was smaller; in one 6 inches in diameter, in the other the size of a large grapefruit. Pleurectomy was performed with excellent results.

They do not contend that such results will be obtained in every case of chronic empyema, but emphasize the fact that in their experience pleurectomy has not produced the degree of shock the Schede operation does, and believe it should be attempted before extensive resections of ribs. If the lung only partially expands, the Schede or Estlander method can then be used as a second operation.

The preparation of patients for this operation is considered important. Drainage should be at the most dependent part of the cavity, and if such is not the case it should be established. After this patients have gained 15 to 25 pounds in a few weeks. Autogenous vaccines should also be employed and the cavity irrigated with a weak iodine solution twice daily.

On operation, exposure must be obtained to make the entire cavity accessible. The cavity should be swabbed with strong tincture of iodin. The incision through the thickened pleura is best started posteriorly along the vertebræ. Bleeding has not been excessive, and in cases where the lung was injured no harm has resulted. Abundant drainage to the farthest points of the cavity should be provided for by small gutta-percha drains.—(E. H. H. O.)

HYGIENE AND SANITATION.

C. N. Fiske, Surgeon, and R. C. Ransdell, Passed Assistant Surgeon, United States Navy.

Schmidt, P. **Further experiences with the Berkefeld filter in the purifying of lead-contaminated water.** Arch. f. Hyg., Bd. 82, Hft. 8.

In previous investigations (volume 80 of these archives) the writer had established the fact that lead-contaminated water may be freed of that metal by passage through a Berkefeld filter. The present experiments were conducted to determine how long the filter retains its efficiency in this respect—a very practical question.

While traces of lead appeared in the filtrates at times, particularly in the first liter after standing overnight, the apparatus could be depended upon to reduce the amount of lead in any ordinary contamination to one-sixth or less of the original amount, especially if the water also contained traces of iron. The water used in these experiments held 0.02 mg. Fe_2O_3 per liter, and upon examination the tubes were found completely covered with an oxyhydrate which evidently presented a new filter layer for the lead.—(T. W. RICHARDS.)

Cook, F. C. Hutchison, R. H., and Scales, F. M. **Experiments in the destruction of fly larvae in horse manure.** Bull. Depart. Agric., No. 118, July 14, 1914.

The great activity in antifly campaigns in recent years, together with the recognition of the fly as a disease carrier, has created such a widespread demand for some means of destroying the fly that this investigation has been undertaken for the purpose of finding a chemical that will destroy this pest in its principal breeding place, namely, horse manure, without injuring the bacteria or reducing the fertilizing value of the manure. The paper reviews some recent experiments, the results of which point to an economical, practical, and effective way of destroying fly larvæ by the chemical treatment of manure.

The larvacidal power of a number of chemicals was considered, together with their effects on the value of manure, so far as may be estimated by chemical or bacteriological analysis.

The house fly is attracted to horse manure, possibly by its odor, and on alighting crawls an inch or so under the surface and there lays its eggs. On account of the temperature of the manure the eggs hatch within one day. The larval stage continues from four to five days, during which the larvæ migrate to the sides of the pile and toward the base, feeding on the manure during their journey. The pupæ are found, after a few days congregated in the outer edges of the manure near the ground. It is about 10 days from the time the eggs are laid until the mature fly emerges.

In the experiments 24 different chemicals were tried in various concentrations. Of these, only 7 showed any effective larvacidal action in the strengths used. These substances may be arranged in two classes: (1) Unsatisfactory or partially satisfactory; (2) satisfactory. The term satisfactory is used to indicate destructive action on fly larvæ, noninjurious effect on manure, and lack of extremely poisonous properties.

Among the unsatisfactory or partially satisfactory substances are included several which, when used in large amounts, may kill fly larvæ, but are placed in this class because of the large amount required or because of their extremely poisonous qualities.

UNSATISFACTORY OR PARTIALLY SATISFACTORY SUBSTANCES.

Kerosene emulsion.	Pyroligneous acid.
Kainit.	Sodium chlorid.
Isthmian Canal Commission larvacide.	Copper sulphate.
Iron sulphate.	Lime-sulphur mixture.
Several proprietary disinfectants.	Paris green.
Potassium cyanid.	Sodium fluorid.
Formaldehyd.	Ammoniacal gas liquor.
Calcium cyanamid.	

SATISFACTORY SUBSTANCES.

Borax.

Calcined colemanite (crude calcium borate).

By far the most effective, economical, and practical of the substances is borax in the commercial form in which it is available throughout the country. Borax increases the water soluble nitrogen, ammonia, and alkalinity of manure, and apparently does not permanently injure the bacterial flora. The application of manure treated with borax at the rate of 0.62 pounds per 8 bushels (10 cubic feet) to soil does not injure the plants thus far tested, although its cumulative effect, if any, has not been determined.

The following directions are given for treating manure with borax to kill fly eggs and maggots.

Apply 0.62 pound borax or 0.75 pound calcined colemanite to every 10 cubic feet (8 bushels) of manure immediately after its removal from the barn. Apply borax, particularly around the outer edges of the pile, with a flour sifter or any fine sieve, and sprinkle 2 or 3 gallons of water over the borax-treated manure.

The reason for applying the borax to the fresh manure immediately after its removal from the stable is that the flies lay their eggs on the fresh manure; and borax, when it comes in contact with the eggs prevents their hatching. As the maggots congregate at the outer edges of the pile, most of the borax should be applied there.

The treatment should be repeated with each addition of fresh manure, but when the manure is kept in closed boxes less frequent applications will be sufficient. Where the calcined colemanite is available it may be used at the rate of 0.75 pound per 10 cubic feet of manure and is a cheaper means of killing the maggots.

In addition to the application of borax to horse manure to kill fly larvæ, it may be applied in the same proportion to other manures as well as to refuse and garbage. Borax may also be applied to floors and crevices in barns, stables, markets, etc., as well as to street sweepings, and water should be added as in the treatment of horse manure.

After estimating the amount of material to be treated and weighing the necessary amount of borax, a measure may be used which will hold the proper amount, thus avoiding subsequent weighings Larger amounts of borax than that indicated will injure most plants.

It is recommended that all public health officials and others in recommending the borax treatment for killing fly eggs and maggots in manure, warn the public against the injurious effects of large amounts of borax on the growth of plants.

The cost of the borax treatment is estimated at 1 cent per horse per day.—(A. B. CLIFFORD.)

MICHIE, H. C. **Investigation relative to the life cycle, breeding, and some practical means of reducing the multiplication of flies in camp.** The Military Surgeon, August, 1914.

This investigation was undertaken from the standpoint of the military man while in camp, simple and practical methods and results being always kept in view.

Breeding and dissemination of flies in camp is easy because it is so difficult and expensive to dispose of human and horse excreta and all waste materials, and also to prevent access of the fly to excreta. Not only are these excreta excellent culture media for breeding flies, but kitchen garbage was proven an even better one. Odor, unsightliness, and the presence of infectious matter from whatever source make it absolutely necessary to dispose of all wastes.

The methods used were:

For human excreta: Pits covered with fly-proof latrine boxes, burned out daily with crude oil and hay.

For kitchen garbage: Solids burned; liquids evaporated.

For horse excreta: Picket lines scraped and swept daily, the material being burned and hauled to a dump once a week. This is not as easy as apparent, for it is found difficult completely and surely to burn all waste in the mass.

Adult flies and a large number of larvæ were found about, and even to a depth of 2 feet within the ground where refuse had been dumped.

In studying the stages of development it was noticed that eggs seemed to be passed rapidly in mass, the female not being killed by the act. When deposited in suitable culture media, having heat, moisture, and food present, these eggs hatched and developed into larvæ in from 12 to 21 hours. These larvæ became pupæ in from 4 to 6 days, and adults in about 5 days more. Therefore, according to the conditions present, the adult fly appears in from 10 to 12 days. The eggs are susceptible to desiccation, which prevents hatching, and this stage seems to be the most vulnerable time in the life cycle.

Larvæ are about three-fifths of an inch long, composed of 10 segments, larger at the tail than the head, actively motile, and they can bore into ordinary earth with little difficulty. Earth impregnated with lime seems to kill larvæ. They are, however, resistant to drying and sunlight, but usually seek cover and moisture. They can live and their development continue in ordinary soil. Larvæ come to or near the surface for the pupal stage.

The pupal stage begins about the fourth or fifth day, marked by a thin white membrane which appears several times over the larvæ and is discarded. The pupa is dark brown in color, oval in shape, of about 10 segments, a soft formless body covered by a hard, thin shell,

one end of which drops off about the fifth day and an adult fly emerges.

Only a small number of pupæ developed in a dry place become adult flies, and these adults very soon die for want of water and food. The pupal stage is considered the most resistant one in the life cycle. Light plays an important part in this stage of development, no growth occurring in absolute darkness.

Adult flies are of full-grown size upon emerging from the pupæ.

A very small red ant was found to destroy every egg exposed; to kill and drag away larvæ; destroy the contents of any shell it gained access to; and was seen to attack, kill, and dismember full-grown flies. It is doubtlessly true that ants destroy a great number of flies, and at all stages of their development, escape being possible only by the flies being deep in the earth.

Desiccation suggested itself as a means of preventing fly breeding, and was tried in the following manner with practical and satisfactory results. Animal excrement was spread evenly, not exceeding 4 inches, over a large area, allowed to dry, and was then burned and the space again used. This dump was practically free from flies, had little odor, and was in a sanitary condition inexpensively achieved. Picket lines were cleaned daily, burned over weekly, and all scrapings were spread over the dumping area and burned. Kitchen garbage was treated as before, kitchens were screened, and pollution of the ground prevented, or lime used. Wire fly traps baited with fish, fly swatters, and a poison made by mixing milk or condensed milk, diluted 1 to 1 with water, with formalin in proportions of one dram of the latter to one ounce of the mixture, were used. This poison placed in shallow pans killed flies which ate of it in 15 or 20 minutes.

The beneficial effects of these methods soon became evident, and in conclusion it is recommended that: Fly traps and swatters be a part of company equipment; instruction be given in the character of the life cycle and dangers of the fly; kitchen garbage be burned; cans smashed; water evaporated; incinerators cleaned daily and contents burned; more attention paid to picket lines and wet packed manure; and the scrapings spread and burned; more lime used about kitchens and rears.—(W. E. EATON.)

SIMPSON, R. J. S. **Humidity and heat stroke.** Jour. Roy. Army Med. Corps, XXIII, No. 1, July, 1914.

The original article should be consulted by those interested in the lucid elaboration of Haldane's dictum that "it is clear that in still and warm air what matters to the person present is neither the temperature of the air nor its relative saturation nor the absolute per-

centage of aqueous vapor present, but the temperature shown by the wet bulb thermometer." (Jour. Hyg., V, p. 494.)

It is emphasized that "at a constant temperature evaporation is proportional to the difference between the amount of water present in the air and the amount which it can take up at that temperature, the saturation deficit. In relation to heat stroke, for a clothed man we must take not the observed air temperature but that of the skin-shirt layer of air (which, for ordinary conditions of movement and external temperature at least, is 89° F.), as it is in this layer that evaporation takes place. * * * The result then is, taking conditions which occur under ordinary circumstances in hot climates and working out the actual weights of water in the air, that even at low relative humidities, when the wet bulb stands at the critical point (worked out for 85° F.), there is sufficient water vapor in the air to interfere to an important degree with evaporation from the skin and so to lessen to a serious extent the loss of heat from the body. Haldane's results then are applicable to the ordinary climatic conditions of hot climates, and the fact that the relative humidity may be low gives an entirely false impression of the actual conditions as regards the quantity of water vapor present."

The wet bulb temperatures above which body temperature begins to rise at an accelerating rate vary, of course, with exercise and movement of the air. At work (2,590 foot-pounds per minute) in still air the critical point was found to be 78° F., and with air moving at 1.5 miles per hour it was 85° F., as given above; at rest in still air the critical point was 88° F., and with air moving at 2 miles per hour it was 93° F.—(C. N. F.)

PEMBREY, M. S. **Heat stroke. Further observations on an analysis of 50 cases.** Jour. Roy. Army Med. Corps, XXII, No. 6, June, 1914.

The present paper results from a further study of the affection among British troops in India with special reference to the direct action of the sun's rays, sweating, treatment, after affects, loss of efficiency, and causes of death.

Iced enemata, ice to head and neck, and a dose of calomel were as usual found most efficacious, the circulation in the skin not always being sufficient to reduce the temperature of the interior of the body through iced baths.

There were 10 deaths and 605 sick days among the other 40 cases.

"Death appears to be due to the effect of the high temperature upon the nervous system and the heart. The proteins of the nerve cells may be coagulated, and a partial coagulation of the proteins of the respiratory and cardiac muscles may assist in the production of failure of respiration and of the heart."

With regard to prevention the author clearly shows that "if heat stroke is a disordered regulation of temperature, due to exposure to a high temperature, the methods of prevention are clearly those directed to diminish the production and increase the loss of heat. Muscular work increases the production of heat and the activity of the heart; the greater the load, the greater the effect. Unsuitable clothing, by preventing the cooling effect of sweating, diminishes the loss of heat. A man can work hard on a hot day if the air be not too moist, but he must cool his body by sweating freely and he must drink copiously in order to maintain the reserves of water in his tissues. Progressive training results in the economical performance of work even under adverse external conditions which are beyond the control of man. The countermanding of marches on a hot day is not the height of efficiency, for in warfare it may be imperative to perform a forced march on a hot day. Efficiency is found in the recognition of dangers and the capacity to escape or mitigate them by intelligent precautions. The guidance afforded by the wet bulb thermometer is more important than that of the dry bulb. Further attention might be drawn to its indications, which would serve as a warning for special precautions by night as well as by day. There is no doubt that a hot, moist, and stagnant atmosphere is especially distressing at night; it would seem that the nervous control of the temperature of the body is less perfect during sleep, especially in those who are unwell or under the influence of alcohol.

"These are old-fashioned truths which have always received recognition in the medical service of the Army. In discussing the question of the prevention of heat stroke, Sir James Ranald Martin wrote: 'Parades, formalities, the majestic English march, regulations, and appearances must here be utterly and at once discarded, for it is a question of life and death. The open, disorderly looking order of march, however slovenly it may seem to the lieutenant colonel, must here be used, the close order being nothing short of stifling and sickening the men by regulation. The genius of pipe clay must here concede something.' Close order means a hot moisture-laden atmosphere, and an uneconomical expenditure of muscular and nervous energy in maintaining rank."—(C. N. F.)

TROPICAL MEDICINE.

E. R. STITT, Medical Inspector, United States Navy.

DAY, H. B, and FERGUSON, A. R. **The treatment of ancylostoma anemia.** Lancet London, July 11, 1914.

It is noted that the usual treatment for expelling the worms is a combination of thymol and betanaphthol, the latter drug reducing

the dose of thymol necessary and causing a greater disintegration of the thymol crystals. The dose is 3 grams of thymol and 3 grams of betanaphthol given in three or four two-hourly doses. The usual fasting and purging preliminaries are insisted upon.

The expulsion of the worms is usually succeeded by a gradual disappearance of the anemia, a rise in the number of red corpuscles preceding the rise in hemoglobin percentage.

As the anemia is of a chlorotic type, iron is strongly indicated. Simple forms of iron by mouth seem more satisfactory than organic compounds of iron. It is noted that manganese can not be substituted for iron, and that in severe cases the combination of arsenic and iron is essential to recovery, but that arsenic alone is not of value.—(E. R. S.)

CHRISTIE, W. L. **Latent dysentery or dysentery carriers.** Brit. Med. Jour., July 18, 1914.

In this article the author notes that in Sarawak, Borneo, many people, white and native, become pale, thin, wasted, and weak with what is practically a dysentery but without dysenteric stools. In such cases he has found abundant amebas of the histolytica type, and has succeeded in restoring such patients to normal health by treatment with salines and a few injections of emetin.

He notes that malaria is rare, yet many cases of debility, anemia, and "fever" have been ascribed to malaria when the cause was amebiasis. It is interesting to read the statement that persons feeling "rotten," as they call it, or suffering from neurasthenia, become fit after the amebas are cleared from the colon and the resulting colitis and septic state relieved.

Formerly it was customary to give such cases quinin, but now calomel and salines are found more efficacious.—(E. R. S.)

BACOT, A. W. **Naphthalene for the destruction of mosquitoes.** Brit. Med. Jour., July 4, 1914.

The author notes that while oil is better for exposed water surfaces, for cisterns or wells naphthalene has advantages owing to its slow evaporation and the fact that the vapor is fatal to adult mosquitoes.

The flakes of naphthalene may be suspended above the water surface in the cistern, in which case there is no taste imparted to the water. Not only does the vapor stupefy or kill adult mosquitoes, but in quantities of 1 gram of naphthalene to 924 square centimeters of surface area of the water mosquito larvæ are killed in about 24 hours.

The experiments were conducted in the laboratory.—(E. R. S.)

Deeks, W. E. Emetin in amebic dysentery. Ann. Trop. Med. and Parasit., July 22, 1914.

Deeks reports several cases in which he had success in the treatment of cases of acute dysentery and amebic abscess of the liver. He gave the drug hypodermically in doses of one-third grain repeated two or three times a day. To one case he gave 2 grains in two 1-grain doses.

He notes that slight nausea has been observed in only two cases. Deeks believes that emetin acts as a direct poison to amebas, as does quinin to the malarial parasite. The author thinks it advisable to combine his bismuth treatment with the emetin treatment, to secure more lasting results.

The bismuth method, which is given in another article in the same number of the journal, is as follows:

After a preliminary dose of castor oil:

"First. Rest, in order to increase the patient's resistance and give the minimum of movement to the bowel. This is classical treatment in all acute infections.

"Second. A generous milk diet, because it is a physiological, nutritious diet, admits of a minimum of intestinal putrefaction, and is practically all absorbed before it reaches the large bowel, which, owing to its ulcerative condition, is more or less physiologically inert.

"Third. Saline or plain water irrigations, one to three daily, purely for the purpose of lavage, in order to rid the bowel of toxic products.

"Fourth. The administration of bismuth subnitrate in heroic dosage. We give a heaped teaspoonful, equivalent to about 180 grains by weight, mechanically suspended in almost a tumbler of plain or, better, effervescent water, every three hours, night and day in severe cases, only lessening the amount when improvement takes place. The mechanical suspension in a large amount of water is essential, otherwise it is prone to form a paste or solid mass, thus lessening its physiological effect. When the stools begin to lessen in number, and the tongue becomes clean, the number of doses is lessened to three or four daily. In very chronic cases it is wise to continue one or two doses daily for a month after convalescence is established. The absolute milk diet is not departed from until the tongue cleans, the tenderness over the bowels disappears, the elasticity of the skin returns to normal, and the stools have been reduced to one in 24–48 hours; then a normal diet may be gradually resumed as in convalescence from typhoid. We do not object to, but recommend, plain fruit juice once or twice a day instead of milk during the acute attack."—(E. R. S.).

PATHOLOGY, BACTERIOLOGY, AND ANIMAL PARASITOLOGY.

A. B. CLIFFORD, Passed Assistant Surgeon, and G. F. CLARK, Passed Assistant Surgeon, United States Navy.

LEVADITI, C., DANNLESCO, V., and ARTZ, L. **Meningitis by injection of pyogenic microbes in the peripheral nerves.** Ann. de l'Inst. Pasteur, XXVIII, April, 1914.

It has been pretty well felt in the past that the poisons of rabies and poliomyelitis will travel up the course of a peripheral nerve trunk and thus reach the central nervous system. These authors, working with the median nerve of the monkey, have succeeded in producing acute cerebrospinal meningitis by the injection of an organism which was apparently the pneumococcus. The incubation time for the appearance of the meningitis was three days. Evidence of a neuritis preceding the meningitis makes it seem that the infection travels along the lymph spaces in the nerve sheath.—(A. B. C.)

FÜRST. **The growth of pathogenic intestinal bacteria in bread.** München. med. Wchnschr., June 30, 1914.

Fürst reports an epidemic of typhoid fever in which bread seemed the most probable vehicle of transmission. The bread supply of the infected area was obtained from a bakery in a neighboring town where several cases occurred among the baker's staff.

Other commoner sources for the epidemic were ruled out. Fürst on this account conducted inoculation experiments with different kinds of breads and found that various organisms of the typhoid-cholera group could live in bread over considerable periods of time, depending on the hardness and thickness of the crust. From this evidence Fürst believes that in future epidemics bread must be considered as a possible carrier of disease.—(A. B. C.)

MCNEIL, A. **Present status of the complement fixation test in the diagnosis of gonorrheal infections.** New York Med. Jour., August 22, 1914.

The article gives the results of the examination of 5,381 specimens in the serological laboratory of the New York City Health Department; 971 were positive, 1,314 were doubtful, and 3,096 negative. In many cases it was impossible to obtain a reliable clinical history, but where the work was checked from a clinical standpoint the results amply confirmed the statement made by Swartz and McNeil in 1911 and 1912 that "a positive reaction denotes the presence or recent activity in the body of a focus of living gonococci."

The technique of the test is identical with that of the Wassermann test for syphilis, with the exception that an antigen prepared from pure cultures of gonococci is used, and the tests are placed in the ice

box for six hours to fix complement, instead of the usual one hour in the incubator at 37° C.

Their antigen is prepared from 10 of the Torrey varieties of gonococci. Eighteen to 24-hour old cultures grown on salt-free veal-agar slants in Blake bottles are washed off with 10 c. c. distilled water to the bottle and the resulting suspension is heated in the water bath for one hour at 56° C., followed by one hour at 80° C. It is then filtered through paper pulp in a Büchner filter and then through a Berkefeld filter, when, after being made up to the proper tonicity by adding 10 per cent of a 9 per cent saline solution, it is standardized and is ready for use.

The author's conclusions remain the same as those published by Swartz and McNeil in 1912.

1. A positive reaction denotes the presence or recent activity in the body of a focus of living gonococci.

2. A negative reaction does not exclude gonococcus infection but. for the reasons stated, should be accorded considerable importance.

3. A strong positive reaction is not to be expected earlier than about the fourth week, and then only in very acute cases with some complication.

4. A positive reaction is not obtained if the disease is limited to the anterior urethra.

5. A positive reaction does not entirely disappear until about seven or eight weeks after cure.

6. In other words, if a strong positive reaction is obtained seven or eight weeks after apparent clinical cure, the patient should be looked upon as harboring gonococci.

The technique of the complement fixation test is simpler than that of isolation of the gonococcus in culture and the probabilities of error are less.—(A. B. C.)

NOGUCHI, H. **Practical application of the luetin test.** New York Med. Jour., Aug. 22, 1914

A little over two years ago it was shown that certain cases of syphilis give a distinct local reaction to an endodermal injection of a sterile extract of the pure culture of *Treponema pallidum.* Among nonsyphilitic individuals there was no such reaction.

From this fact it was made probable that the luetin reaction, as it has since been called, is specific for syphilis and that it depends upon the allergetic condition of the skin, comparable to the tuberculin reaction in tuberculosis. The reaction is more uniformly present in chronic cases than in primary and secondary forms of acquired syphilis. In congenital syphilis the reaction is more frequently found to be positive among late cases than among newborn infants.

Based on the observations of about 50 investigators in this country and abroad, we obtain the following statistical estimation of the practical value of the luetin reaction.

Primary syphilis: Mild reaction present in less than 30 per cent of cases.

Secondary syphilis: Reaction, usually mild, present in 47 per cent of 630 cases.

Tertiary syphilis: Reaction in 80 per cent of cases usually severe (pustular form).

Congenital syphilis: Reaction in 70 per cent of cases. Brown found it present in 93 per cent of 75 cases.

Syphilis of the nervous system: The reaction is less frequently present in acute syphilitic meningitis than in the parenchymatous affections, such as general paralysis and tabes, where it was positive in about 60 per cent of cases.

Visceral syphilis: The reports of Wolfsohn, Stoll, and others show that the reaction is present in nearly 90 per cent of cases; it is especially marked in cases of aortic insufficiency.

The author then discusses the relation of the luetin reaction to the Wassermann reaction.

He believes that the fact that the two do not always run parallel can be explained by the fact that the luetin reaction indicates the allergy and the Wassermann the presence of an active syphilitic process.

The author thinks that it is not at all improbable that paretics with a positive luetin reaction are still capable of deriving some benefit from an antisyphilitic treatment, since the reaction is, in a measure, indicative of a mesenchymatous tertiary process.—(A. B. C.)

EYE, EAR, NOSE, AND THROAT.

E. J. GROW, Surgeon, and G. B. TRIBLE, Passed Assistant Surgeon, United States Navy.

Misting of eyeglasses. Am. Drug. and Pharm. Rec., LXII, No. 7, p. 247, July, 1914.

The use of a spectacle lotion prepared according to the formula given below will be found of great value in preventing the fogging or misting of the laryngoscopic mirror during laryngoscopy, etc. Microscopists, more especially those working in the Tropics, who experience trouble in keeping the ocular lens clear will find this lotion indispensable.

Castile soap, dry	1 ounce.
Glycerin	2 drams.
Water to make	8 ounces.

Cut or shave the soap into small pieces, dissolve in the mixture of water and glycerin by aid of gentle heat, and strain while warm. Add a few drops of oil of lavender to perfume if desired. This mixture when cold is usually a soft, clear, jellylike mass, and is best dispensed in jars. Directions for its use are: Rub a small quantity on the eyeglasses or spectacle lenses and polish with a soft, dry cloth.

The best results are obtained by covering the entire surface of the mirror or lens with a thin film of the lotion and then polishing with Japanese lens paper.—(HOSPITAL STEWARD E. L. SLEETH, U. S. NAVY.)

DARBIEUX, J. **The treatment of ocular syphilis by salvarsan and neosalvarsan.** Ann. d'Ocul., May, 1914.

Salvarsan is most effective in conditions which occur in recent syphilis. The efficacy of this drug is greatest in acute iritis and iridocyclitis, and in gumma of the iris.

Affections of the retina are rebellious to arsenical preparations.

Gummatous processes are equally well affected by mercury and salvarsan, and neither of these has any marked effect against gumma. In those cases where there is considerable pain and photophobia, arsenical preparations appear at their best. We see that the arsenical preparations, while showing a truly specific action, do not accomplish the destruction of the organism, for which we had looked and which must always remain a great desideratum of therapeutics.—(E. J. G.)

BAHN, O. A. **The moving picture and the eye.** New Orleans Med. and Surg. Jour., Oct., 1912.

He found, after viewing moving pictures, congestion of the lids, lachrymation, retinal fatigue, pains in the eyes, headaches, muscae volitantes, and dizziness. He believes the moving picture to be a decided strain on the eyes, especially if there is any refractive or muscular error.—(E. J. G.)

DE SCHWEINITZ, G. E. **Treatment of various forms of ocular syphilis with salvarsan.** Therap. Gaz., May 5, 1912.

He regards noninflammatory optic atrophy as a contraindication, but thinks the treatment should be instituted in specific optic neuritis. His experience has been contrary to that of some who do not believe it to be beneficial in syphilitic interstitial keratitis.

The use of salvarsan he has found to be disappointing in ptosis of the ocular muscles.—(E. J. G.)

POERCHER, W. P. **Rapid, painless, and bloodless method for removing the inferior turbinate.** Jour. Am. Med. Assn., LXIII, No. 7.

The nose is anesthetized with crystals of cocain and a solution of epinephrin. The mucous membrane is elevated over the lower turbinate, the bone is drilled through lengthwise with an extra long Curtiss nasal trephine and the projecting edges smoothed off with cutting forceps. A Bernays compressed sponge which has first been wrapped with paraffin paper, but the ends left exposed, is introduced. The tampon is removed in three days. The paper prevents the sponge from adhering, while the exposed ends absorb enough moisture to make sufficient pressure to stop hemorrhage. A simple oil spray is used after tampon is removed.—(G. B. T.)

PAGE, J. R. **Hemorrhage from the superior petrosal sinus, as a complication in operations on the lateral sinus.** Jour. Am. Med. Assn., LXIII, No. 6.

The cases in which hemorrhage from the superior petrosal are likely to occur are those in which the thrombus in the sigmoid extends to the region of its entrance, but does not enter it. In cases of mastoid operation an injury to the sinus may give rise to a clot which does not block the petrosal. Then if pressure is not properly applied hemorrhage may be so extensive as to interfere with the operation, the wound must be packed, and the patient returned to bed, with the source of his infection present.—(G. B. T.)

HAWES, J. B. **The frequency of laryngeal tuberculosis in Massachusetts.** Boston Med. and Surg. Jour. CLXXI, No. 1.

In order to obtain more complete data, examinations of the larynx were requested and made, on a total of 1,245 patients afflicted with tuberculosis. These cases were either in the various State sanatoria or on their waiting lists. A total of 83 cases of laryngeal tuberculosis was found among 1,019 cases in the sanatoria and 17 reported among 236 tubercular cases on the waiting list. This gives a total of 100, or 8 per cent plus. In the opinion of the author this percentage is not high enough, since a large number of advanced cases, among whom tubercular laryngitis is more or less frequent, are being cared for in the private institutions.—(G. B. T.)

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THOMPSON, S. **Intrinsic cancer of larynx.** Lancet. No. 4735.

Alteration of the voice is the principal symptom. Persistent hoarseness calls for a careful inspection of the larynx. The growth can be frequently removed by endo-laryngeal operation even when it involves the whole length of the cord. Laryngo-fissure is the operation of choice in the author's opinion. First, because the disease remains superficial and limited for a considerable time; second, this can not be considered a dangerous operation. A lasting cure is obtained in 80 per cent of cases.—(G. B. T.)

PALMER, D. H. **Treatment of hematoma of the auricle.** Northwest Med., Dec., 1913.

Cleanse the ear surgically, plug the external auditory canal with sterile cotton. Incise over the swelling. Remove all clots, newly formed cartilage or bone and scrape the anterior surface of the old cartilage until smooth. Close the incision except for a small opening that will admit an eustachian catheter connected to a Pynchon pump. Remove by suction all secretions and coapt skin and cartilage. Dry the ear, place a clean cotton plug in the meatus, coat skin with vaseline, and pour plaster of Paris cream into cardboard mold surrounding ear. The catheter is gently turned so that a channel will be made. Withdraw catheter; the passage left will drain the cavity. Apply a small gauze bandage to support cast. Remove cast in 10 days. The author reports a series of 35 cases treated in this manner; no recurrences or infections took place.—(G. B. T.)

REPORTS AND LETTERS.

CARE OF WOUNDED AT MAZATLAN AND AT VILLA UNION.[1]

By S. G. Evans, Medical Inspector, United States Navy.

On the morning of August 11, 1914, I took Surg. P. S. Rossiter, Passed Asst. Surg. H. W. Cole, Hospital Steward P. V. Tuttle, Hospital Apprentices (first class) R. L. McKim and C. J. Owen, and Hospital Apprentice I. A. Nash ashore to offer assistance to the wounded of the Constitutionalist forces, of whom there were at this time 73 quartered in the second story of the Casino Building at Mazatlan and more being brought in all the time, reaching a total of 119.

The total number of wounds is recorded as follows:

Abdominal (perforating)	5
Abdominal (nonperforating)	1
Brain	3
Larynx (tracheotomy performed)	1
Lung	11
Neck	1
Pelvis (perforating)	4
Pelvis (penetrating)	1
Face	1
Amputation (arm)	1
Wounds of upper limb	40
Wounds of lower limb	85
Total	159

Deaths to date:

Wound of brain	1
Abdominal perforating	1
Total	2

Of all wounds 51 per cent were infected. One hundred and nineteen original dressings and 210 redressings were applied. All cases bore transportation well.

Of the five abdominal perforating wounds all were brought in over 24 hours after receipt of injury; none was operated upon; all

[1] Abstracted from the official report.

should have recovered, but one who on the ninth day got out of bed. walked about, and ate a hearty meal, developed peritonitis and died within 24 hours.

Hearing from Dr. F. B. Ketchul, who was apparently the only medical officer with the said force, that at Villa Union, about 26 miles from Mazatlan, there were many more, and that they were the most severely wounded. I left Surg. Rossiter in charge in town and went with Dr. Ketchul, Passed Asst. Surg. Cole, Hospital Apprentice (first class) McKim, and Lieut. C. C. Soule, United States Navy (who volunteered and showed marked ability and zeal), across the bay, taking such instruments as Dr. Ketchul had and such dressings as we could carry; thence by railway motor car to Presidio Station, and thence by carriage to Villa Union. Here we found in a large country house 36 very severely wounded men and boys, the youngest 14 years of age and the oldest 27, with 54 wounds, classified as follows:

Abdominal, perforating	1
Abdominal, nonperforating	1
Cranium, perforating	2
Cranium, nonperforating	1
Thorax, perforating	1
Upper limbs	21
Lower limbs	25
Scrotum	1
Penis	1
Total	54

with the following special injuries, not included in the above:

Fracture, humerus	2
Fracture, tibia and fibula	1
Aneurism, traumatic, axilla	1
Amputation left leg (shell)	1

Fifty-four per cent of the wounds were infected. None were seen less than 48 hours after receipt of the injury.

The perforating abdominal wound was not operated upon. The bullet was found under the skin to the right and lodged in the second lumbar vertebra. Patient had been ambulant since receipt of the wound.

Fifty-four dressings were applied, representing 36 wounded men. These men were lying on mats on the spacious porches with over half the wounds infected and many gangrenous and maggoty, the men having lain in the field or dragged themselves through the bushes for one or two days with no dressing and only a dirty rag tied crudely over the wound. One, for instance, with three wounds in the shoulder, one penetrating the lung at the apex, being dressed with two filthy pieces of sacking tied on with a string picked up in the field.

We worked unceasingly until late at night, leaving to the last an amputation of the left leg, 4 inches below the knee, a gangrenous shell wound necessitating it. This operation was performed on a kitchen table, with only two dim oil lamps, dull instruments, but a liberal use of antiseptics, and yet upon leaving Mazatlan six days afterwards it was reported to me that the patient was doing well.

Finishing about 1 a. m., we drove to the station only to find that, owing to an accident, no trains were running, so we were compelled to sleep, as best we could, on the platform and on top of freight cars, without covering or mattresses and in white uniform. We arose at 4.30, expecting an early train, but none coming, were compelled to return on a hand car most of the way, the motor having broken down. We finally arrived in Mazatlan about 2 o'clock almost exhausted from lack of water, food, and sleep.

The final result of all our work I do not know, but prior to the departure of the ship from Mazatlan on August 17 I was informed that no more had died and all were doing well.

As far as I could learn the forces had no regularly organized medical corps, no nurses except those mentioned, and practically no facilities for caring for the wounded in the field.

Much over 60 per cent of the wounds were infected and many gangrenous, but a liberal use of iodine seemed to work wonders in conjunction with the stamina and stoicism of the men.

I can not speak too highly of the energy and spirit of all on this trip, and of their zeal and efficiency under the most arduous and trying conditions.

MEDICO-MILITARY REPORTS OF THE OCCUPATION OF VERA CRUZ.[1]

REPORT OF MEDICAL INSPECTOR L. W. SPRATLING, FLEET SURGEON, ATLANTIC FLEET.

By direction of the commander in chief I went ashore about 7 o'clock in the morning of April 22, 1914. At this time the forces were actively engaged in the occupation of Vera Cruz. I remained on shore in my capacity as fleet surgeon as an observer and adviser until April 23, when I was assigned as inspector for the sanitary department in the civil government of Vera Cruz. I continued on this duty till relieved by order of Gen. Funston on April 30.

During the fighting of the 22d I was present most of the day at the brigade field hospital, south end of the Terminal Building; saw some of the fighting and had an excellent opportunity to observe the work of the Medical Department. The dead and wounded were

[1] Abstracted from the official reports.

brought in promptly and carefully. The wounded showed that they had received careful attention at the dressing stations. The stretcher men brought them in without confusion or excitement and returned promptly to their stations. The working of this department went as smoothly as though at a routine drill. Surg. M. S. Elliott, of the *Florida*, was brigade surgeon of the entire force landed. His untiring efforts and effective work deserve special commendation.

On taking charge of the sanitary affairs of the civil government I was given full authority to do whatever was necessary and to sign orders "By direction of the commanding officer, U. S. Naval Forces on shore."

The members of the board of health, except the quarantine officer, who served under a Federal appointment, were willing to continue work, not as officers in the pay of and under the American Government, but in their capacities as physicians "for the sake of humanity."

On April 23 I appointed Dr. A. I. Campbell, an American physician fully qualified to act as such, health officer of the port (quarantine). On April 28 Surg. G. M. Guiteras, United States Public Health Service, who had reported to the commander in chief, was assigned this duty, and Dr. Campbell was directed to report to him as assistant.

Dr. A. R. Goodman, an accomplished American physician, with a thorough knowledge of the local people and conditions, was appointed assistant to the inspector of the sanitary department on April 26. He gave valuable assistance.

Dr. Goodman and Dr. Campbell volunteered their services without compensation, but I informed them that their salaries would be left for future adjustment.

The street-cleaning department resumed work on April 24 and the other employees of the sanitary department on April 27. The laborers were unwilling to accept money for their services, but wanted and received rations.

Surg. G. M. Guiteras, Public Health Service, was, on April 29, in addition to his duties as medical officer of the port, assigned as first assistant to the inspector of the sanitary department, and on April 30, by direction of Brig. Gen. Funston, United States Army, I turned over to him the affairs of the sanitary department.

On Thursday, April 23, accompanied by Surg. Elliott, all the hospitals of the city were visited. The Military Hospital had been abandoned. San Sebastian, the charity hospital of the city, had been used during the fighting as a point of vantage by the snipers, and as a consequence had been under fire. About 300 patients had received no attention for two days. Surg. D. N. Carpenter, with Passed Asst. Surgs. S. L. Higgins and H. L. Kelley, were directed to

give the required assistance. They worked here faithfully until the native physicians returned. Surg. C. E. Riggs, of the *Louisiana*, was directed to maintain a supervisory interest in the hospital during the stay of the Navy on shore. Bedding and clothing were given San Sebastian from the naval school. As far as known no patients were injured during the fighting.

During and after the fighting there were complaints of lack of respect for the Red Cross, and this subject has been carefully considered. There may have been instances where individual Mexicans fired on the Red Cross, but I think in the large majority of cases the firing was unintentional and resulted from the Red Cross being so close to the firing force. This proximity was unavoidable. The Mexicans have an organization corresponding to the Red Cross. Its flag is blue, with a white cross. This society did excellent work during and after the fighting in taking care of the dead and wounded natives. They recognized that their emblem was and would be abused and used by unauthorized persons, and notified us that all their members would wear a white cross, surcharged by rubber stamp, with the seal of the organization. The greatest abuse of this and the Red Cross was the using of them for unauthorized purposes by unauthorized persons.

REPORT OF SURGEON M. S. ELLIOTT, UNITED STATES NAVY, DIVISION SURGEON.

On April 21, 1914, the occupation of Vera Cruz was begun by the brigade under the command of Capt. William R. Rush, United States Navy, consisting of the First Regiment of Marines, from the U. S. S. *Prairie*, Lieut. Col. W. C. Neville, United States Marine Corps, and the Second Regiment, Lieut. Commander Allan Buchanan, United States Navy, from the U. S. S. *Florida*. The landing was effected without resistance at 11.30 a. m. at Pier No. 4. Preliminary plans had been made for the establishment of a field hospital at Pier No. 4.

The following medical officers landed on April 21: Brigade surgeon, Surg. M. S. Elliott, United States Navy; regimental surgeons, Surg. Jacob Stepp, United States Navy; Passed Asst. Surg. H. L. Kelley, United States Navy; Passed Asst. Surg. J. B. Pollard, United States Navy, of the Second Regiment of Marines; Passed Asst. Surg. R. J. Straeten, United States Navy, battalion surgeon, U. S. S. *Florida;* and Asst. Surg. W. E. Eaton, United States Navy, battalion surgeon, U. S. S. *Utah*.

The field hospital at Pier No. 4 was under the command of Surg. Stepp with Passed Asst Surgs. Kelley and Pollard as assistants. Passed Asst. Surg. Straeten accompanied the *Florida* battalion.

There were eight hospital corpsmen from the Marine Brigade at the field hospital, and with the *Florida* battalion were three hospital corpsmen and eight stretcher bearers. One hospital apprentice was detailed as orderly to the brigade surgeon.

The field hospital was located in a frame building at the head of the pier adjacent to the boat landing. There was running water in the building, which answered its purpose fairly well until it was abandoned later in the day. The Red Cross flag was flown from the roof.

Shortly after the landing was made, firing began, and the wounded began to arrive at the field hospital. The marine regiment under Lieut. Col. Neville, United States Marine Corps, was stationed along Calle Montesinos, commanding the streets running north and south. The *Florida* battalion was ordered to seize the customhouse and post office.

The ambulance party was divided so as to render aid to the different companies, and with the marine battalion were a number of hospital corpsmen. The main portion of the *Florida's* ambulance party was stationed at the crossing of the Calle Benito Juarez and Avenida Morelos. Here they were exposed to direct fire from housetops and windows. Within a few minutes after firing began four men were wounded and dressed at the aid station and sent to the field hospital at the landing. In the meantime the wounded began to come in from the marine firing line. The *Florida* ambulance party was obliged to change station behind the bonded warehouse and remained in this position until 6.30 p. m. During this time 2 dead and 12 wounded had been treated and sent to the field hospital. The following is a comment from the battalion commander's report of the *Florida* in reference to the *Florida's* ambulance party: "The Hospital Corps and stretcher bearers of the ambulance party should be highly commended for their strict attention to duty and behavior under a heavy fire. In the hottest skirmishes of the first day's fighting the wounded were attended to without the slightest delay and without a thought of the personal danger encountered in leaving cover."

About 2 p. m. Passed Asst. Surg. Pollard was sent from the field hospital to the marine firing line to take charge of wounded.

As soon as the wounded reached the field hospital they were examined and re-dressed if necessary, tagged, and names and wounds recorded. Boats were available, and they were immediately sent to the *Prairie*, which was utilized as a base hospital until the next day, the 22d, at 10 a. m., when the *Solace* arrived and was used for this purpose. Some of the slightly wounded were returned to their own ships, and all dead were returned to their own ships.

Surg. Harry Shaw, United States Navy, of the *Prairie*, deserves great credit for his care of wounded on the 21st. Without much warning, 19 wounded were sent on board his ship to be taken care of. Fleet Surg. Pope, of H. M. S. *Essex*, and the surgeon of the Spanish cruiser *Carlos Cinco*, assisted Passed Asst. Surg. Shaw in his work, and Surg. J. M. Brister, United States Navy, of the *Utah*, rendered assistance.

The number of casualties treated at the field hospital during the 21st was 22 wounded and 4 dead.

Late in the afternoon it was decided to remove the field hospital to the Terminal Building, which was much better in every respect. The south end of the ground floor was utilized, where there was plenty of room, light, and water. During the day the field hospital was under fire practically all the time and several bullets went through the building.

At 1.24 p. m. of the 21st the *Utah's* battalion landed and took station on the firing line. Asst. Surg. W. E. Eaton, United States Navy, one hospital steward, two apprentices, and eight stretcher bearers accompanied this battalion. As soon as they landed two bearers and a stretcher were ordered to accompany each company, except the marine company which joined the marine regiment. Asst. Surg. Eaton and the rest of his party remained at the field hospital and rendered assistance. During the night the *Utah's* ambulance party took station near the firing line behind the customhouse. During the 22d they kept in touch with their own battalion and also rendered assistance to the *Arkansas* battalion. The men of the party were several times under fire, and are highly spoken of by Asst. Surg. Eaton.

The *San Francisco* battalion landed during the early morning of the 22d. The ambulance party under Passed Asst. Surg. T. W. Reed, United States Navy, established an aid station in a warehouse near the water front at the head of the Fiscal Mole. At this station two dead were taken care of, and six wounded of our own men and three Mexicans were dressed. This station of a necessity was established in an area in which there was constant firing during the early morning of the 22d, and had to work at a great disadvantage. All its wounded were promptly sent off to the *Solace*, including three Mexicans who were seriously wounded.

During the 22d the fighting continued, and the field station at the Terminal Hotel was constantly receiving wounded and sending them to the *Solace*, which arrived at 10 a. m. The arrival of the *Solace* was a great relief to everyone concerned.

The *Arkansas* battalion was landed at 3 a. m. on the 22d; with this battalion was an ambulance party under command of Passed Asst.

Surg. S. L. Higgins, United States Navy, with one hospital steward, one hospital apprentice, first class, and eight bearers. This battalion formed part of the First Regiment, Naval Brigade. This ambulance party did excellent work with its own battalion, and also with the Second Regiment near the Naval Academy. In the performance of their duties they were under fire. About 23 wounded were treated by the ambulance party of the *Arkansas* battalion.

The Second Regiment, Naval Brigade, consisting of battalions from the *New Hampshire*, *South Carolina*, *Vermont*, and *New Jersey*, under command of Capt. E. A. Anderson, United States Navy, landed at 3.45 a. m. April 22.

The medical officers of this regiment were Surg. C. D. Langhorne, United States Navy, regimental surgeon; Asst. Surg. J. T. Borden, United States Navy, and Asst. Surg. C. C. Wilson, United States Navy, battalion surgeons, with 12 hospital corpsmen and a number of stretcher bearers. Surg. Langhorne established a dressing station behind the sanitary building on the water front, and his ambulance parties were most active in rendering aid to wounded. Surg. Langhorne mentions in his report the excellent work done by his hospital corpsmen.

By the evening of the 22d most of the wounded had arrived at the Terminal Hotel and had been transferred to the *Solace*. During the night several wounded and dead were brought in and sent off to the *Solace*, and on the morning of the 23d the field hospital was clear.

There was no delay in getting the wounded off; a number of boats were available at the landing at all times. With the exception of 2 dead and 9 wounded sent off by the *San Francisco* aid station and 4 dead and about 14 wounded sent off by the Second Regiment, all dead and wounded passed through the field hospital at Pier No. 4 during the first and Hotel Terminal during the second day. Several of the severely wounded died after arrival at the field hospital. Every case, with a few exceptions, was examined and re-dressed. Tincture of iodine was freely used, and wounds were protected by pads secured with adhesive plaster. Very few cases came in tagged, and there was some difficulty in securing names, rates, and the ships to which they belonged. The following table gives the number of killed and wounded. The percentage of killed and wounded is approximate.

April 21, 1914: Total number engaged, including officers and men, 1,209; killed, 4; wounded, 22; percentage of killed, 0.330; percentage of wounded, 1.819.

April 22, 1914: Total number engaged, including officers and men, 3,375; killed, 13; wounded, 41; percentage of killed, 0.385; percentage of wounded, 1.214.

Total killed, 17; total wounded, 63; total casualties, 80; total percentage of killed, 0.503; total percentage of wounded, 2.570.

During the remainder of the occupation the various medical officers and their detachments were occupied in looking out for their own men, doing sanitary work, and giving what assistance they could in getting things in shape. A regimental dispensary was established in the police station.

The field station in the Terminal Hotel was kept in commission until the 25th, when it was closed and the medical officers and hospital corpsmen rejoined their regiments. After the 22d several medical officers were on duty at the field hospital in addition to the regular detail, including Surg. D. N. Carpenter and Surg. A. Stuart. Surg. Stuart volunteered for duty with the marines, and was detailed to Maj. Catlin's regiment as regimental surgeon. Passed Asst. Surg. P. R. Stalnaker also volunteered for this duty. Passed Asst. Surg. Straeten and the ambulance party of the *Florida* also were on duty at the field hospital while the *Florida* battalion was in reserve. The hospital corpsmen of Surg. Carpenter's brigade hospital rendered most valuable aid at the field hospital.

After the field hospital was abolished a rest and aid station was opened at the boat landing for the care of patients going to the *Solace* and their ships. This station was in a small building well suited for the purpose. Its equipment consisted of the *Florida's* ambulance party and gear. Additional stimulants, dressings, etc., were obtained from the *Florida.*

The above gives briefly the operations of the Medical Department on April 21 and 22, while I was brigade surgeon of the naval brigade. The balance of the report covers incidents which came to my knowledge as division surgeon on Admiral Fletcher's staff.

On April 23, in company with Fleet Surg. Spratling, an inspection was made of the city's hospitals to determine their condition and to ascertain the approximate number of killed and wounded on the Mexican side.

The city has four hospitals, the largest being San Sebastian, situated near the naval school. This hospital corresponds to a municipal hospital, and is supported by charity. On inspection in the morning of the 23d the hospital was in a deplorable condition. It contained approximately 363 patients, 68 of whom were wounded. The normal capacity is 200. These patients had received practically no attention for two days. They were short of food and dressings. Fifty-six killed had been received or died after reaching the hospital, and had been buried in the hospital grounds. On the afternoon of the 22d Passed Asst. Surgs. Straeten and Kelley had dressed about 19 cases, but were obliged to cease work on account of the firing from the roof of the hospital and in the vicinity. Sniping continued in this vicinity for several days and the hospital was searched several times. Among the patients were a number of Fed-

eral soldiers, and most of the wounded and killed were soldiers, policemen, and citizens who had been fighting.

Surg. D. N. Carpenter volunteered to take charge of the hospital and was directed to do so, and to take such assistants as he required, and, with Passed Asst. Surgs. H. L. Kelley and S. L. Higgins, worked indefatigably for two days, dressing wounded, operating, and generally administering the hospital. Most of the attendants remained on duty, but the attending physicians had left their work. These men returned to their attending duties after the city became quiet. Food for the first two days was furnished from the ships' stores. Authority was given Surg. Carpenter to obtain linen, blankets, and clothes from the demolished Naval Academy near by, and a large supply of drugs were obtained from the abandoned military hospital. Four cases of smallpox were isolated in the hospital. All inmates were vaccinated by the 25th and the smallpox patients transferred to the pesthouse.

The White Cross Hospital is situated in the center of the city: when inspected, 46 wounded were noted; 40 dead had been buried from this hospital; 60 wounded had been treated, who were not in the hospital, most of them slight. This hospital was running smoothly and was fairly well supplied and did not require assistance. They had done good work during the fighting, caring for dead and wounded. The society corresponds to our Red Cross. The insignia is a white cross on a blue field. The emblem was abused several times by persons not connected with the organization and it was finally necessary to stamp the white cross with the official seal of the society to protect its members. This organization deserves great credit for its work. Its accommodations and resources were taxed to the limit. Among the wounded were about 20 soldiers connected with the Mexican forces.

At the Women's hospital were found 2 dead and 1 wounded. There were 112 patients in this hospital, the normal capacity being 120. They did not need immediate assistance.

The Military Hospital was abandoned, most of the patients had probably been sent to San Sebastian.

The Spanish Hospital, or Sociedad Española di Beneficencia, is situated on the outskirts of the city to the south. Here 20 wounded had been treated and 1 dead. Number of patients in hospital, 22; total capacity, 33. They did not need assistance of any kind. They reported that all their wounded and dead were citizens.

The approximate number of dead on the Mexican side is between 152 and 175. Accurate figures can not be obtained. An estimate of the wounded is still more inaccurate. The number treated at the various hospitals was 195; a large number were treated by our own people, and undoubtedly a number left the city the first day and

others were not treated at all. A conservative estimate would be 250 wounded.

The health of the forces while on shore was excellent. Several cases of mumps developed and were returned to their ships. In certain parts of the city and at the outposts mosquitoes were abundant. No provision had been made to furnish nets.

This report gives briefly the activities of the Medical Corps and the Hospital Corps. I can speak only with the highest praise of their attention to duty and of the many acts frequently performed under fire.

REPORT OF SURGEON C. D. LANGHORNE, REGIMENTAL SURGEON, SECOND NAVAL REGIMENT.

The battalions of the Second Regiment from the *Vermont*, *New Hampshire*, *South Carolina*, and *New Jersey* left their ships at 4 o'clock a. m., April 22, 1914, and landed at Pier No. 4 under cover of darkness. The battalions were marched to the Plaza, in front of the Terminal Hotel, where the regiment formed, and I reported to the regimental commander and met the different units of the Hospital Corps. I had associated with me Asst. Surgs. C. C. Wilson, of the *New Hampshire*, and J. T. Borden, of the *New Jersey*. The hospital corpsmen were from the above-named ships.

At 8 a. m., it having been decided that our regiment, in connection with the marines and other regiments ashore, should take the rest of the city, the Second Regiment left the Terminal Hotel and went along the water front (the head of the inlet at the lighthouse), passed along the naval academy, the head of the column going up the Calle Esteban Morales at the side of the Naval Academy and turning at the preparatory school, down the street that leads to San Sebastian Hospital. When the column had reached this position an active fire was coming from the Naval Academy and preparatory school and the houses along the water front before reaching the Naval Academy.

Several men were shot while the center of the regiment was at the head of the inlet. The main part of the Hospital Corps established itself behind the sanitary building on the water front, and 4 or 5 wounded men were sent off to the ships in the *Vermont's* boats before I got there, as I was at the head of the column, by the assistant surgeons, and their names were not obtained. The *New Hampshire* battalion at the head of the regiment encountered the heaviest fire, from the Naval Academy and preparatory school, and retreated down the street and formed skirmishers in the open space between that and the water front. I helped collect the wounded and formed a dressing station on the water-front side of the light-

house building. There we collected four dead and nine wounded. These were later moved to behind the sanitary building, and one dead and several wounded were brought in and sent off to the ships in the *Florida's* and *Vermont's* boats. The *New Jersey* battalion remained in this vicinity and the rest of the regiment went along the water front, returning by Avenida Libertad to the Cuartel. It then occupied Las Cocos and outposts the night of the 22d.

Part of the Hospital Corps went with the *Vermont*, *New Hampshire*, and *South Carolina* battalions, and later the whole Hospital Corps, with the exception of one hospital steward and the heavy equipment, joined the regiment on Avenida Libertad at the Cuartel and went out to Las Cocos and outposts with the three battalions for the night.

On the morning of the 23d I was ordered by the regimental commander to return to the Cuartel in Vera Cruz and establish a regimental hospital. I returned to the Cuartel and started to try and clean the place and got 3 rooms fairly clean for sick quarters and general cleaning of the building going on. When I found that there had been smallpox and spinal meningitis among the soldiers and prisoners that had occupied the buildings, I recommended to the division surgeon and also to the regimental commander that the buildings be evacuated. We evacuated the buildings about 7 p. m. and moved to the lighthouse building and sanitary building on the water front, which buildings were occupied until we returned to the ships on April 30.

The regiment did outpost duty at Las Cocos, sending out two battalions every night, and one battalion did patrol and guard duty in the city in our district. So that a battalion got only one night in four in the barracks.

I wish to extend my thanks to the hospital corpsmen associated with me, all of whom did excellent work, especially Hospital Stewards N. L. Saunders, J. E. Baum, and J. H. Schreiter.

REPORT OF SURGEON J. STEPP, UNITED STATES NAVY, REGIMENTAL SURGEON, SECOND MARINE REGIMENT.

The following medical officers joined the Second Advance Base Regiment, United States Marine Corps, on board the U. S. S. *Prairie*, at Philadelphia, Pa., on November 27, 1913, have remained with the regiment since, and landed at Vera Cruz: Surg. J. Stepp, Passed Asst. Surg. H. L. Kelley, Passed Asst. Surg. J. B. Pollard (relieved Passed Asst. Surg. P. R. Stalnaker December 21, 1913).

At the earliest opportunity, and especially during the regimental maneuvers at Culebra, all preparations were made and much interest

shown by the entire corps in familiarizing with the new medical and surgical Army field equipment, especially in view of the fact that from the onset all felt that we were preparing for some duty in Mexican waters.

On the eve of the occupation of Vera Cruz the Medical Department was in thorough readiness. On April 21, about 11 a. m., the first battalion of the Second Regiment, under Lieut. Col. Neville, landed at Pier No. 4, Vera Cruz, without resistance.

The commanding officer ordered the establishment of a field hospital, and the small baggage building at the head of said pier was selected, the Red Cross flag being promptly raised, and preparations made for the treatment of possible wounded. Two hospital corpsmen, with one litter, were detailed to each of the three companies of the command. Passed Asst. Surg. J. B. Pollard accompanied the battalion to the firing line, remaining there throughout the two days' engagement. After the firing commenced, additional hospital corpsmen were dispatched to the firing line to assist in the transportation of the wounded.

Throughout the first day's firing the litter bearers were constantly exposed to sniping as they bore in the wounded, and the field hospital itself, from time to time, was under fire, although a large Red Cross flag was plainly visible.

About dusk of the first day, by order of the division surgeon, the field hospital was transferred to the waiting room of the Terminal Station. At this point the duties of the Medical Department were continued throughout the remainder of the engagement.

On the first day practically all dead and wounded were cared for by the force of this regiment at the field hospital. On the second day, April 22, with the establishment of a field hospital on Sanidad Pier and a dressing station at the customhouse, the joint medical forces were better able to handle the situation. The wounded and dead were transferred promptly to the U. S. S. *Prairie* and later to the U. S. S. *Solace*, on the arrival of the latter vessel.

During the entire two days' fighting all members of the Hospital Corps worked unremittingly without any relief whatsoever. The work was of the most arduous nature, the men being much of the time exposed to the enemy's fire, and was efficiently and uncomplainingly carried out. It would be invidious even to attempt to draw comparisons between the members of the Hospital Corps of the regiment, as all are deserving of the highest praise.

At 2 a. m. April 22 a portion of Maj. Butler's battalion, with Passed Asst. Surg. B. H. Dorsey, were landed from the U. S. S. *Chester*. This detachment was on the firing line throughout the remainder of the engagement, and all wounded were transferred immediately to the field hospital after application of first aid.

The contents of the paragraph in relation to the work of the members of the Hospital Corps are in all ways applicable to the men of this detachment. All worked with that untiring zeal, devotion, and courage that marks the true American at such trying times.

REPORT OF PASSED ASSISTANT SURGEON S. L. HIGGINS, UNITED STATES NAVY, BATTALION SURGEON, U. S. S. "ARKANSAS."

The *Arkansas* arrived in Vera Cruz about 2.30 a. m. April 22, 1914, and one hour later the landing force, composed of four companies of infantry, an artillery section, special details, and ambulance party, consisting of a hospital steward, one hospital apprentice, first class, and eight litter bearers, left the ship. The battalion as a component of the First Regiment, Naval Brigade did a considerable amount of street fighting the first day, and policed its district of the city continuously until relieved by the Army. It was quartered very comfortably in the building called the Hospicio Zamora. The battalion returned to the ship on the afternoon of April 30.

During the fighting of the morning of the 22d a portion of the ambulance party, after taking an officer to the hospital, was unable to find the battalion and joined the advance of the Second Regiment around the Naval Academy. The others advanced at the rear of the battalion up Avenida de Zarogoza, establishing dressing stations from time to time. Although under fire from houses during most of the advance, Hospital Corps and litter bearers alike at all times were ready and gave prompt and intelligent aid to the wounded, and as promptly removed the dead. Hospital Steward N. O. Wicker and Hospital Apprentices, first class, V. M. Coulter and O. Flechs displayed steadiness, zeal, and good judgment under fire in the discharge of their duties.

The *Arkansas* battalion lost two killed and three wounded, one of the latter slightly. Probably 20 men from other ships were also aided by our ambulance party. No medical or surgical aid other than first-aid packets was furnished by this ship to its marine detachment.

After the first day and night of fighting there were no further casualties. The professional work consisted of minor cases, sore throat, bruises, small cuts, etc. The problems of sanitation were at times difficult, owing to a deficient or nonexistent water supply. Only constant inspection and labor made conditions in the heads and kitchen tolerable.

A hospital apprentice, first class, and two litter bearers were detailed for duty in the regimental dispensary established in the police station at the main plaza.

Before our arrival at Vera Cruz the ambulance party received continuous instruction in first aid and transportation of the wounded. Each company likewise received more elemental instruction in the same by a medical officer.

The day before landing each enlisted man of the landing force was required to dye a white uniform with ferrous sulphate and lye according to the suggestion of Surg. C. G. Smith, United States Navy. The color obtained would have been better had we been permitted to start earlier and been able to give a second dipping. The color was serviceable in most cases, an infinite improvement over white. It washed out partially later when the clothes were scrubbed. It is recommended that khaki or forestry neutral clothing be supplied for future landing parties. The white hat, whether colored or not, furnishes little or at least a negligible protection from the sun and should be replaced by a headgear with a brim made of some material impermeable to the sun's rays.

Officers were allowed to wear khaki shirts and trousers and regulation Marine Corps hats. These were a source of great comfort, especially when contrasted with the white uniforms worn after the third day from morning until 6 p. m. The officer's white cap is little or no protection from the sun, and together with white uniforms should have no place in expeditionary duty. Aside from being the most conspicuous possible color, white uniforms needlessly increase the amount of luggage, are far less comfortable for officers and men, greatly increase the amount of work necessary to maintain appearances, and are a general source of mental irritation.

There was a lack of first-aid packages in the *Arkansas* outfit, so that only about 1 man in 4 could be supplied. Owing to the small number of wounded this limited supply proved sufficient for needs. A supply for all was later obtained from the *Solace*. While on the subject of first-aid packets it is in order to state that the hooks are not securely fastened to the packet. It was the rule for first one and then another to pull away from the case and there were no further means of fastening it to the belt and having it available for instant use. Future supplies should be made stronger.

The equipment of the Hospital Corps and ambulance party was generally satisfactory, with the exceptions to be noted. The expeditionary surgical and medical cases were carried ashore, left at the base hospital, and later brought up when the battalion went into quarters.

Two Army litters is the ship's allowance according to the supply table and this number we possessed. With eight men in the ambulance party as organized on most large ships this is insufficient. We borrowed two in our work. With provision made for marines as well

it would seem that each ship should be provided with at least six Army litters as regular equipment.

In accordance with Navy Regulations and the Geneva Convention, dressing stations and field hospitals should be supplied with green and white lights for designation at night. No green light could be obtained.

On two occasions it was necessary to tie large vessels at dressing stations. A needle had to be sterilized and threaded, with consequent delay. It is suggested that Hospital Corps pouches, large and small, be provided with a few tubes of sterile needles threaded with silk or catgut, or both, for such emergencies.

Morphin and stimulants were given hypodermically at dressing stations, and time might have been saved had the pouches contained single-dose hypodermic outfits similar to the Greeley hypodermic unit. These are now supplied in the surgical expeditionary case, and it is recommended that they also be placed in the Hospital Corps pouches.

Accounts from the wounded on the hospital ship indicate that infected wounds are few, due without doubt to the first-aid packets and to the general use of tincture of iodine. To facilitate the use of iodine it is recommended that a metal or other safe container be provided for the bottle, with a swab attached to the underside of the stopper.

In conclusion I must reiterate that the Hospital Corps performed its work well in accordance with tradition, and many lives were undoubtedly saved by its prompt and skillful ministrations.

REPORT OF PASSED ASSISTANT SURGEON R. J. STRAETEN, UNITED STATES NAVY, BATTALION SURGEON, U. S. S. "FLORIDA."

The battalion from the U. S. S. *Florida* landed at Vera Cruz about 11.40 a. m. April 21, 1914. After landing the three companies took different stations, and one stretcher with two bearers was detached with company station at the post office under Ensign Wilkinson, United States Navy.

The rest of the ambulance party followed the battalion commander and Mr. Lowry's company to the crossing of Calle Benito Juarez and Avenida Morelos.

There we were exposed to direct fire from house tops and near-by windows. Within a few minutes four men were wounded, none seriously. These men were dressed immediately with iodine and first-aid packet and sent back to the dressing station on the wharf.

After this we were ordered to take station behind the bonded warehouse. Here we were entirely protected except from long-range

indirect fire from the direction of Avenida Landero; one apprentice and two stretcher bearers were detailed to a place near firing line, but were cautioned to keep under cover. We remained at this station up to 6.30 p. m. Two killed and 12 wounded men and 1 wounded noncombatant were treated here the first day.

On the second day we resumed our station of the previous day at 5.30 a. m., but were soon advanced beyond the custom house, where we were in closer touch with our men. Firing had almost ceased, and the only wounds dressed that day (six men) were from snipers hidden in near-by houses.

The conduct of the ambulance party was excellent. They showed great willingness to do everything required of them, and even under direct fire their bearing was cool and highly commendable.

REPORT OF PASSED ASSISTANT SURGEON T. W. REED, UNITED STATES NAVY, BATTALION SURGEON, U. S. S. "SAN FRANCISCO."

The U. S. S. *San Francisco's* dressing station was located in a warehouse at the beginning of Fiscal Mole, which is about 400 yards north of the field in front of the naval school, in which the sharp engagement took place at 8.30 a. m. on April 22, 1914.

Landing at midnight on the 21st, we began to rig the place as best we could. Firing was going on constantly all around us, and it seemed only a question of a short time when some real action would begin. We had a little room in a corner well protected, but without running water or artificial light. Facilities were bad for doing anything except that of the most urgent kind.

The personnel of this station consisted of one surgeon, one hospital apprentice first class, one hospital apprentice, and five men detailed as stretcher bearers, all from the *San Francisco.*

Shortly after the engagement began, wounded men began to be brought in. Other stretcher bearers than those regularly detailed to the station assisted in this work. Our own men could not have possibly handled the situation so expeditiously.

The surgeon inspected each wounded man as he arrived and, as hastily as possible, determined the extent and seriousness of the injury and probable termination, and the demand for emergency treatment. In this manner, the most urgent cases were treated first; and the ones which could wait were placed under the care of one of the Hospital Corps who, during the interim, rendered rest, comfort, and stimulation.

Two men arrived at this station practically dead; one shot through the sternum just to the right of median line, opposite the insertion of the fourth rib. There was no wound of exit discovered, and it

is assumed that he died of internal hemorrhage; the other had a large ugly wound of the right side, evidently involving lung and the liver. This wound impressed me as having been caused by a rapid-fire gun. Hemorrhage in this case had been very profuse and he was still bleeding. Death took place in a very few minutes.

Another man who, on account of the profuse hemorrhage of the scalp, the matting of his hair, and the intermixture of dirt and blood clot, together with dilated pupils and convulsions, presented such a frightful appearance that death seemed imminent, was for a few minutes left with those for whom it was thought nothing could be done. After tending to the others for whom something could be done I had the hair partially removed to inspect the skull. Much to my surprise I discovered that the would was merely a scalp wound, the bullet grazing the curvature and emerging near the occipital protuberance, without, upon the superficial examination which I was able to make, fracturing the external table of the skull. A diagnosis of contusion of the brain was made on this case. The hemorrhage was stopped, sterile gauze being plugged in the wound as tightly as possible. He was sent off to the U. S. S. *Solace* as an urgent case, and as late as May 3 was reported as doing very well.

The above three men were the most seriously wounded brought to our station. Six others suffering from various gunshot wounds of the extremities were treated and dispatched as rapidly as possible to the U. S. S. *Solace*. Mexicans and Spaniards were treated alike, three being sent to the *Solace* with severe injuries, one having a fractured thigh, one a compound fracture of the left wrist, and the other a severely lacerated back in the vicinity of the pelvis. Several, perhaps a dozen seamen, were given first aid and bandaging to slight wounds and sent off to their respective ships. One man was brought in suffering from a general convulsion, closely simulating epilepsy. After a few minutes rest and quiet he suddenly disappeared, and we never did find out his name or from which ship he came.

On the night of the 22d, about 8 o'clock, an unknown Mexican was treated at our station suffering from a perforating gunshot wound of the right leg near the ankle. He was given first aid and stimulation and retained during the night. The next morning he was taken to San Sebastian Hospital at Vera Cruz.

As I have stated above, no attempt was made to do anything except the most urgent surgery, such as stopping hemorrhage, readjusting tourniquets, applying fresh sterile gauze to wounds, administering stimulation, and passing the cases on the *Solace* as rapidly as possible. Only one bullet was removed, and that from a slight flesh wound of the thigh.

My observation of these cases was that most of the wounds were clean cut, without much tearing or laceration, except those caused

by the rapid-fire guns, in which many shots being received in the same place, there were tremendous lacerations of the tissues. Everyone at our station worked like a beaver for about three hours, rising to the occasion beautifully, and I have nothing but praise for the men and the manner in which duty was performed. I can not refrain from comment upon the admirable way in which first-aid bandages and tourniquets were applied in the field. Instruction in this line has not been wasted. Very little hemorrhage took place at our station.

REPORT OF PASSED ASSISTANT SURGEON W. E. EATON, UNITED STATES NAVY, BATTALION SURGEON, U. S. S. "UTAH."

The ambulance party composed of one hospital steward, two hospital apprentices, first class, and eight stretcher bearers, carrying four Army litters and three Hospital Corps pouches, left the *Utah* with the battalion at 1.24 p. m., April 21, 1914, and soon thereafter landed upon Pier No. 4. The party quickly assembled and two bearers with a stretcher were sent with each company except the marines to the firing line. The hospital steward, the apprentices, and myself were ordered to remain at the head of the pier. Here we assisted in caring for several wounded and in sending them off to the ships. All the afternoon we were exposed to a desultory firing from a near-by tramp steamer and house. At nightfall the party withdrew to the Terminal Hotel. At 11 p. m. the party was ordered to proceed to the rear of a large warehouse near the customhouse and remain there for the night. We were relieved here at 6 a. m. by the ambulance party from the *Florida*. About 7 a. m., April 22, we were ordered to the custom house, where we remained for over an hour, then proceeding in rear of the *Utah* battalion along Saragoso Street to the large market. Two Mexican dead were visited and two others given first-aid dressing in a near-by house.

At about 9 a. m. a call for the ambulance party was heard from some men who were under sharp firing farther along Saragoso Street. I went forward with my party and removed one man, who was shot through the head and who later died. I found this to be the *Arkansas* battalion. Their ambulance party had become lost, and their only available stretcher party was absent, and I therefore remained in their rear, establishing a dressing station in the orphan asylum near San Sebastian Hospital. The *Utah* battalion was out of urgent action. About 5 p. m. I returned with my party to the *Utah* headquarters. I can speak with greatest praise for the men of our ambulance party.

The hooks for securing the first-aid packets to the belt are not sufficiently strong nor well fixed to the metal cover, are easily broken, and the packet soon lost.

Eight is not a sufficient number of men in an ambulance party attending a full battalion. Four men were always necessary to remove a wounded man over the long distances, and such a number should be detailed with each stretcher going with a company. Otherwise, men are required from the firing squad to give assistance.

Work on the days following April 22 was upon sanitary measures about police headquarters and in connection with the regimental dispensary for the First Regiment, Naval Brigade.

It was noticed that stretcher parties were needlessly exposed and sent to carry away on stretchers men not seriously wounded, who could have gone to the rear without assistance; and also in removing the dead to the dock, rather than to cover, from which they could have been removed later.

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